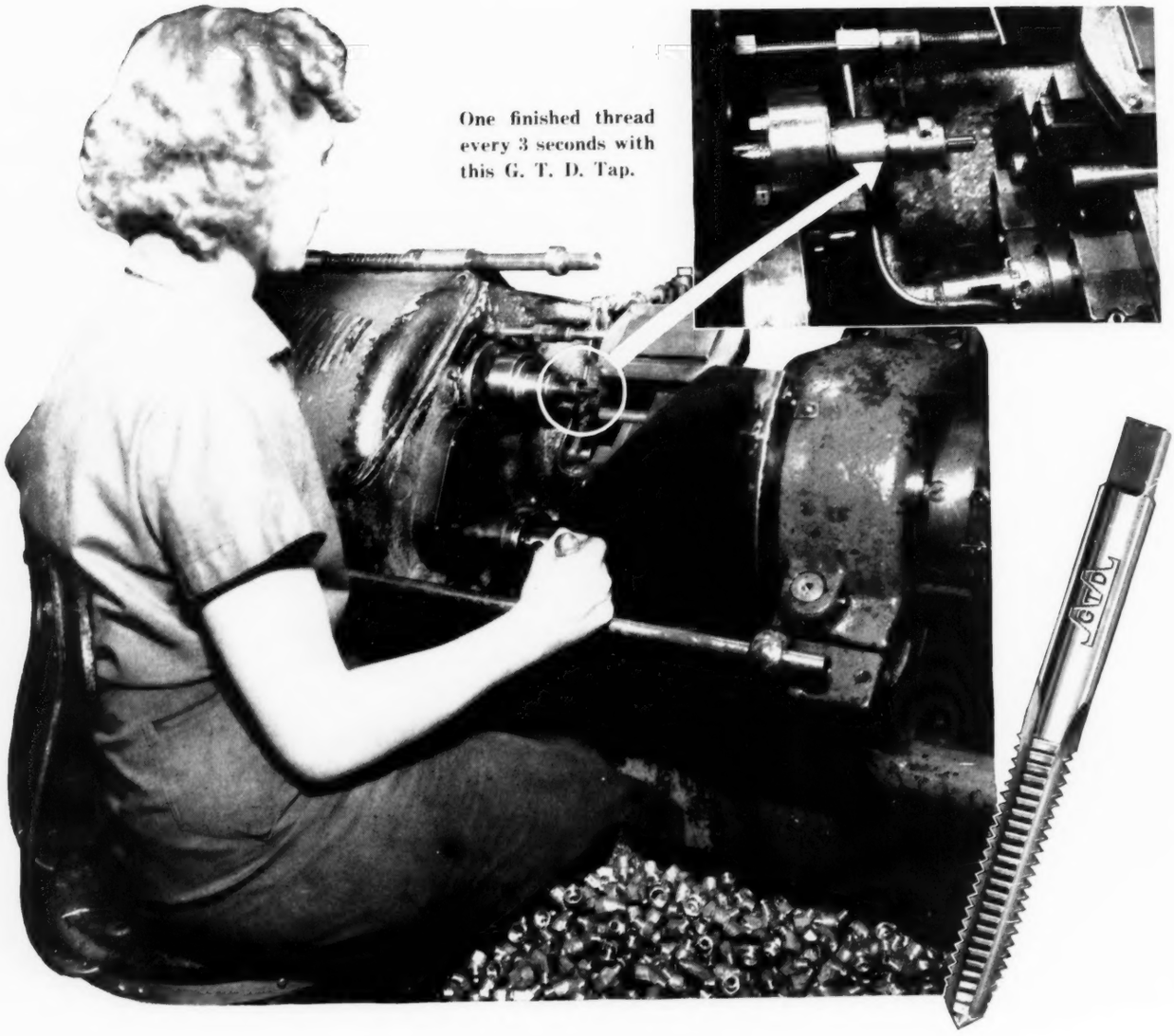
DECEMBER 1940—FORTY-SEVENTH YEAR

MACHINERY

THE INDUSTRIAL PRESS Publishers, 140-148 LAFAYETTE ST., NEW YORK

Performance established leadership for this High Speed Precision Lathe.



MORE PRODUCTION

WITH G. T. D. HIGH SPEED TAPS

Do you want faster production? This company did — on these heavy duty cast brass elbows. They got it, too, when they adopted G. T. D. Greenfield High Speed Ground Thread 7/16-24 Taps. Average production was stepped up from 1050 to 1220 per hour, a 16% increase. And production per tap went from 9,000 to 12,000, up 33⅓ %. These increases represented clear savings because they used the same machine, and even the same cutting lubricant.

G. T. D. Greenfield solicits the opportunity to make equally good in your plant. Our standard and special threading tools are backed by the accumulated experience of over 75 years, all of which is at your disposal. Get in touch with your local distributor or with a G. T. D. Engineer.

GREENFIELD TAP & DIE CORPORATION, Greenfield, Mass.

Detroit Plant: 2102 West Fort St. Warehouses in New York, Chicago, Los Angeles and San Francisco. In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES · PIPE TOOLS

DESIGN, CONSTRUCTION, OPERATION OF METAL-WORKING AND ALLIED EQUIPMENT

MACHINERY

DECEMBER, 1940

American manufacturers planning to produce war materials can learn much from the experience of Canadian industry, which has been engaged in such production for more than a year. January MACHINERY, with the most complete co-operation of the Canadian Government, will present a comprehensive series of articles dealing with the manufacture of shells, cartridge cases, fuses, guns and mechanical transports in the machine shops of our northern neighbor.

Volume 47
Number 4

PRINCIPAL CONTENTS OF THIS NUMBER

For Complete Classified Contents, See Page 184

DEPARTMENTS

TOTAL DISTRIBUTION
18,775

PUBLISHED MONTHLY BY
THE INDUSTRIAL PRESS
148 Lafayette Street New York

ROBERT B. LUCHARS .....*President*
EDGAR A. BECKER *Vice-pres. and Treasurer*
ERIK OBERG .....*Editor*
FRANKLIN D. JONES.....*Associate Editor*
CHARLES O. HERB.....*Associate Editor*
FREEMAN C. DUSTON....*Associate Editor*

LONDON: MACHINERY, 83-113 Euston Road

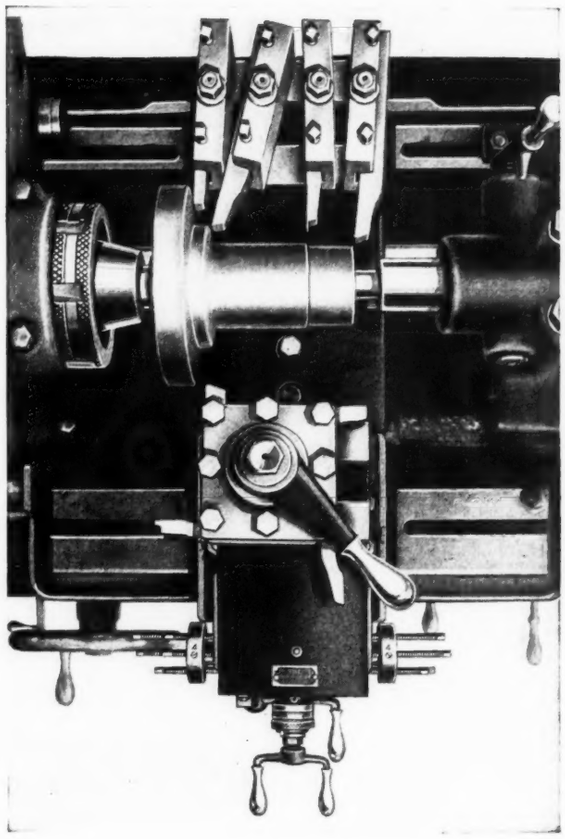
PARIS: La Machine Moderne, 15 Rue Bleue

SUBSCRIPTION RATES: United States and Canada, one year, $3; two years, $5; three years, $6 (for Canada add 25 cents per year for war tax); foreign countries, $6 a year. Single copies, 35 cents. Changes in address must be received by the fifteenth of the month to be effective for the forthcoming issue. Send old as well as new address.

Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879. Printed in the United States of America. Member of A.B.P. Member of A.B.C.

Double Value in Your Shop

The Lodge & Shipley Manufacturing Lathe offers you double value in your shop by providing the production capabilities of an automatic lathe while at the same time retaining the flexible utility of an engine lathe. A few simple tool- and work-holding attachments make it possible to use the manufacturing lathe as a semi-automatic for the rapid production of duplicate parts at an exceptionally low figure of cost. When desired, any of the special attachments which make up the manufacturing lathe may be instantly disengaged and the machine can be used as a standard engine lathe. If you are interested in lower cost methods of production you probably will be interested in our booklet entitled "Examples of Turning". We will be pleased to send you a copy upon request.



The operations on this gear blank require additional tooling and the four Swivel Tool Holders have been substituted for the High Duty Tool Block in order to perform the facing and necking operations.

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.

LATHES
Good Lathes Only

MACHINERY

Volume 47 NEW YORK, DECEMBER, 1940 Number 4

Pumps for the Oil Fields

Manufacturing Operations in a Well-Known Plant on the Pacific Coast that has been Building Oil-Well Pumps to High Quality Standards for More than Forty Years—First of Two Articles

By CHARLES O. HERB

PUMPS used in lifting oil from the deep wells of petroleum fields must be of high quality in order to withstand the wearing action of the large amount of sand and other abrasive material usually carried by the oil. Forty-two years ago the Axelson Manufacturing Co., Los Angeles, Calif., commenced the manufacture of pumps to meet this condition. The design of these pumps embodied the use of a metal plunger that was a close fit in a metal barrel. They were the first pumps of the metal-to-metal type; later this interchangeable-liner construction became standard in the oil producing industry.

The concern has developed and produced oil-pumps ever since it was founded, and today supplies them to oil fields the world over, together with sucker-rods and other oil-well equipment. In manufacturing parts for oil-pumps, accuracy is demanded to a degree seldom appreciated by engineers not directly connected with the oil industry. This is demonstrated in a striking manner by the illustration Fig. 1, which shows a number of oil-pump liners taken from the inspection bench at the end of a regular production line. The bench is covered by a rubber pad which effectively seals the lower end of the liners when they are placed upright on the inspection table. With the liner in this position, when a ball of the same diameter as the honed bore is inserted in the upper end, the fit between the ball and the liner wall is so nearly perfect as to seal the air in the liner in such an effective manner that it takes one-half hour or more for the ball to drop from top to bottom of the liner.

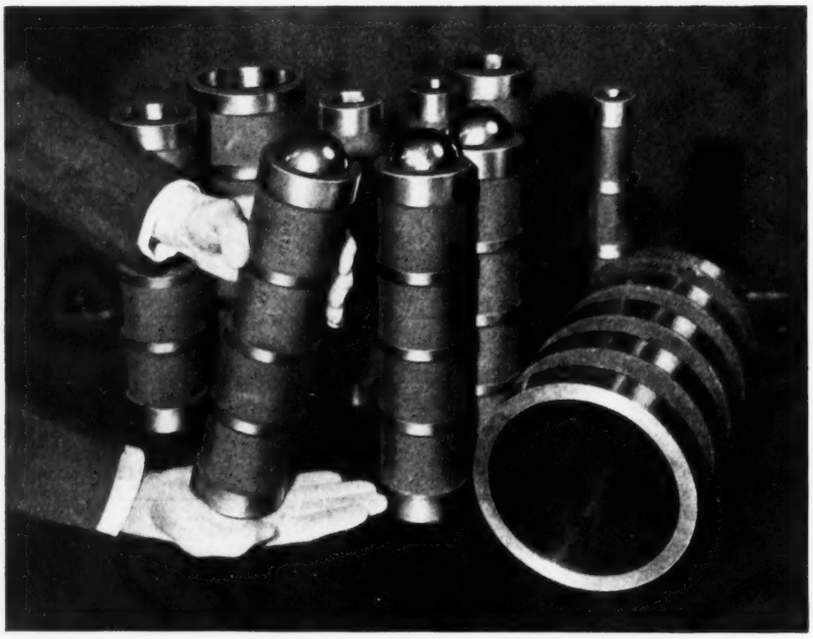


Fig. 1. A Striking Demonstration, Indicating the Accuracy of the Internal Bore in Liners for Oil-pumps

If the ball is struck by the hand while at the top of the liner, it will merely bounce up and down on a cushion of air. Even with three or four liners placed on top of each other, the same condition exists because of the close tolerances specified on the relation between the end faces of the liners and their bores. In 1939, over thirty-eight miles of these liners were honed in the Axelson shop to the specified size within plus 0.0008 inch, minus nothing.

How a high degree of accuracy is obtained in manufacturing the liners, as well as the plungers and valve seats, for oil-pumps will be understood from the following description of the methods employed. All parts for pumps are given 100 per cent inspection. The working gages used throughout the shop are checked periodically from master gages which, in turn, are checked once a year by the U. S. Bureau of Standards. The liners are manufactured from several different materials to a standard length of 12 inches. The inside diameters range from 1 1/16 to 5 3/4 inches nominal size. There are the regular and hardened cast-iron liners; "Super-Service" hardened steel liners, which are made from nickel-molybdenum steel; "Super-Cast" liners, which are centrifugally cast from an alloyed electric furnace iron; and graphitic steel liners, which are produced from seamless alloy steel tubing.

The first operation on regular and hardened cast-iron liners consists of turning cylindrical lands on

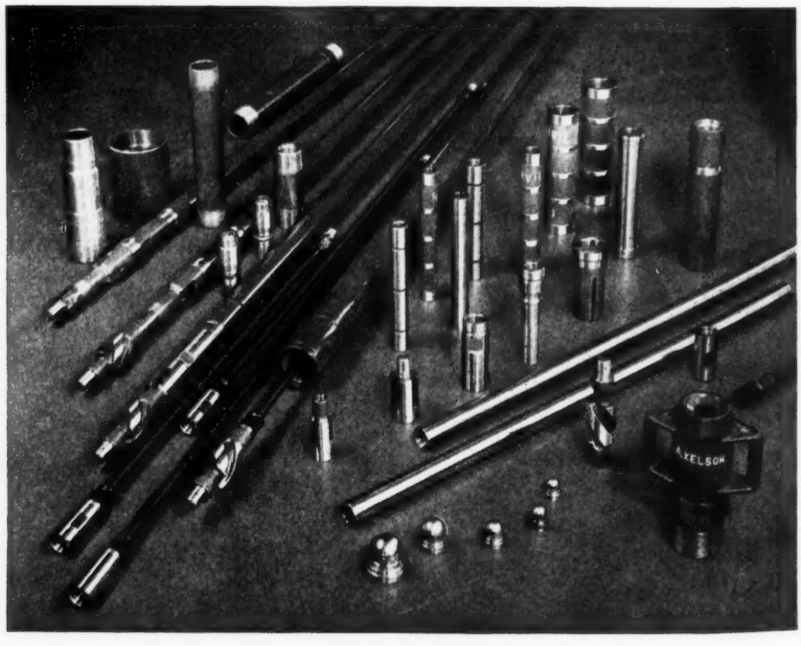


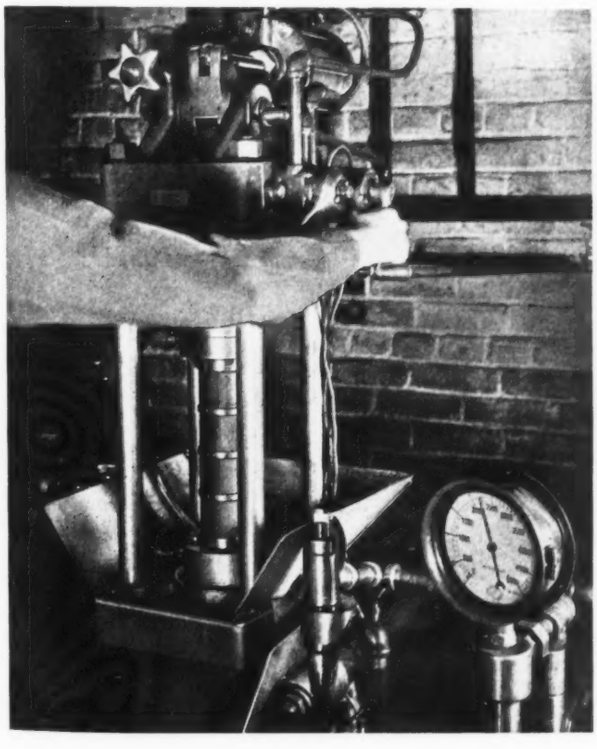
Fig. 2. A Few of the Many Parts Made by the Axelson Manufacturing Co. to Meet the High Accuracy Requirements of the Oil Fields

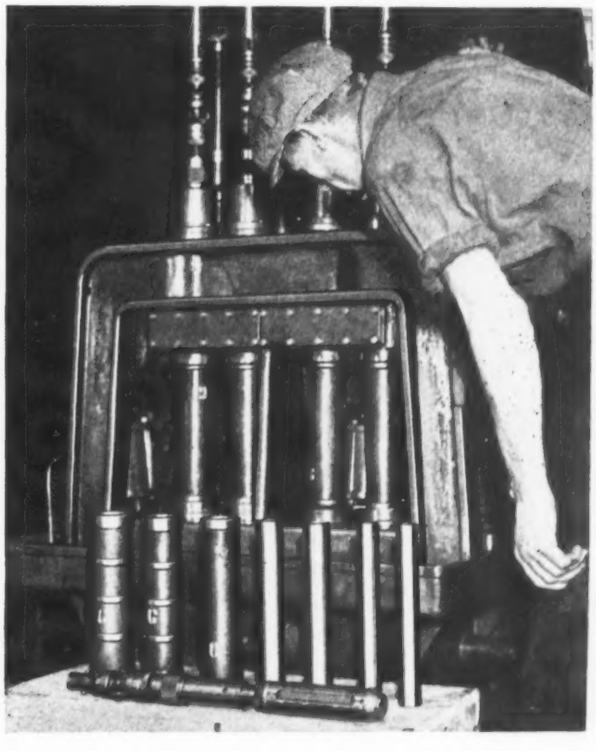
Fig. 3. The First Boring Operation on Regular Cast-iron Pump Liners, Performed in a Six-spindle Machine

the ends and at several points along the length, as well as facing the ends. This operation is performed in a semi-automatic lathe. After the liners have been normalized, the next operation consists of rough-boring them in the six-spindle vertical Moline Hole-Hog machine illustrated in Fig. 3, which is equipped with a fixture having accurate clamping devices that locate and hold the liner castings at both the top and bottom on turned surfaces, thereby avoiding distortion of the work. The clamping devices are actuated by individual air

Fig. 4. (Below Left) Checking Pump Liners for Leakage at a Hydraulic Pressure of over 2000 Pounds per Square Inch

Fig. 5. (Below Right) All Pump Liners are Honed to Size within Limits of Accuracy as Close as Plus 0.0008 Inch, Minus Nothing





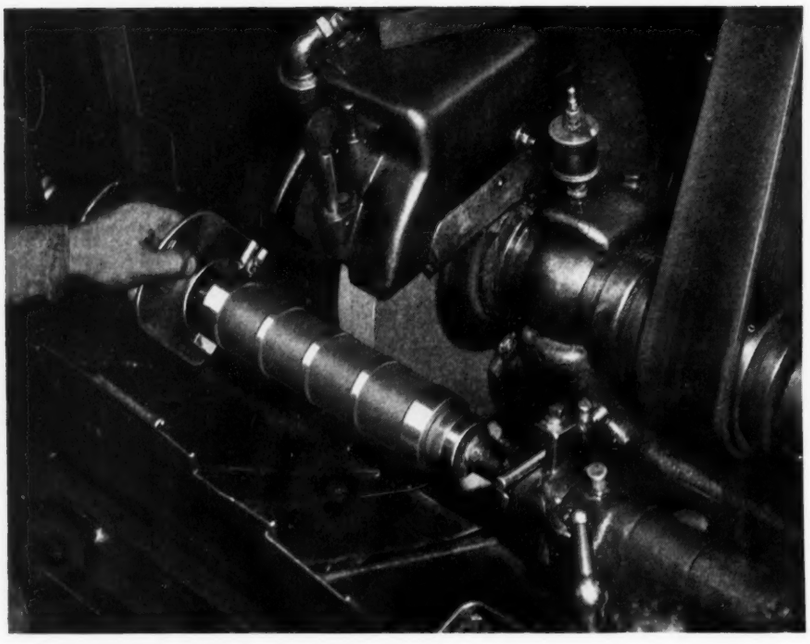


Fig. 6. Finish-grinding External Lands of Cast-iron Liners with Work Mounted on an Arbor Held between Centers

cylinders. The boring heads are equipped with guides that follow the bored liner holes and thus insure straight bores.

Finish-boring of the liners is performed on a similar machine, which leaves from 0.0025 to 0.003 inch of stock on the diameter for removal by honing. Tolerances for the finish-boring operation range from 0.001 to 0.0015 inch. Testing for leakage and other imperfections at a pressure in excess of 2000 pounds per square inch follows the finish-boring operation. This is performed in the hydraulic tester shown in Fig. 4. Pressure is maintained long enough to insure that the material is sound throughout. As in the boring operations, the liners are held by the end faces to avoid distortion.

Two honing operations are performed on each liner, using Barnes four-spindle machines equipped with Micromatic hones. The first honing operation, which is illustrated in Fig. 5, leaves 0.0004 inch of stock per side for removal in the finish-honing operation. At the front of the machine are shown various types and sizes of liners that have been honed. The difference between the maximum and the minimum bore diameters on a finished liner must be within 0.0008 inch throughout the full length. The sizes are checked with a "Go" gage, 13 inches long, which must pass completely through the liner, and a "No Go" gage that must not enter either end.

The lands on the cast-iron liners are then finish-

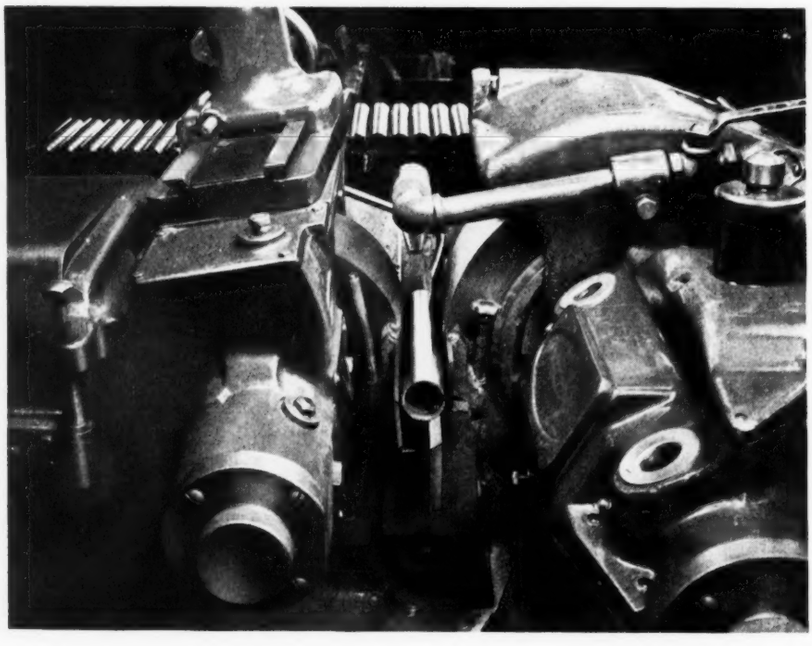


Fig. 7. First Centerless Grinding Operation on Pump Liners to Prepare Them for Finish-boring Operations

Fig. 8. Rough-, Semi-finish-, and Finish-grinding Cuts are Taken on the External Surface of the Pump Liners

ground on the cylindrical grinding machine shown in Fig. 6, the honed bore being held on an arbor between the centers of the headstock and tailstock. This arbor is checked daily for accuracy of diameter and alignment, so as to insure that the outside and inside of each liner will be concentric within close limits. Combination "Go" and "No Go" snap gages are employed to insure that the required tolerance is maintained.

While held on another arbor in an Axelson engine lathe, the ends of the liners are finish-faced to the required length and square with the bore within an unusually close tolerance. Squareness of the liners is of utmost importance because if the faces are not true, even by as little as 0.0001 inch, the assembled liners in a long pump would have an accumulated bow that would prevent proper functioning of the plunger in the liners. At the end of this operation, the sharp corners of the bore at the ends of the liners are removed by polishing with an abrasive stick while the liners are revolved in a lathe.

The turning and rough-boring operations on the hardened cast-iron liners are similar to the first two operations on regular cast-iron liners, as already described. At the end of those operations, however, the hardened cast-iron liners are heated in an electric furnace, quenched in oil, and tempered in a Homo drawing furnace. These liners are then ground on the outside in a centerless grinder, as

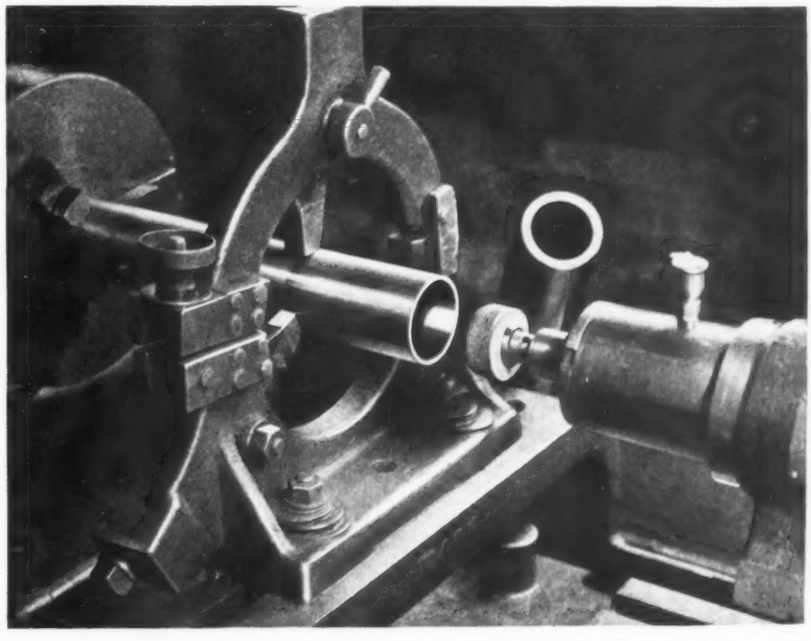


Fig. 9. The Inside Corners on the Ends of Steel Liners are Removed by Grinding prior to the Honing Operation

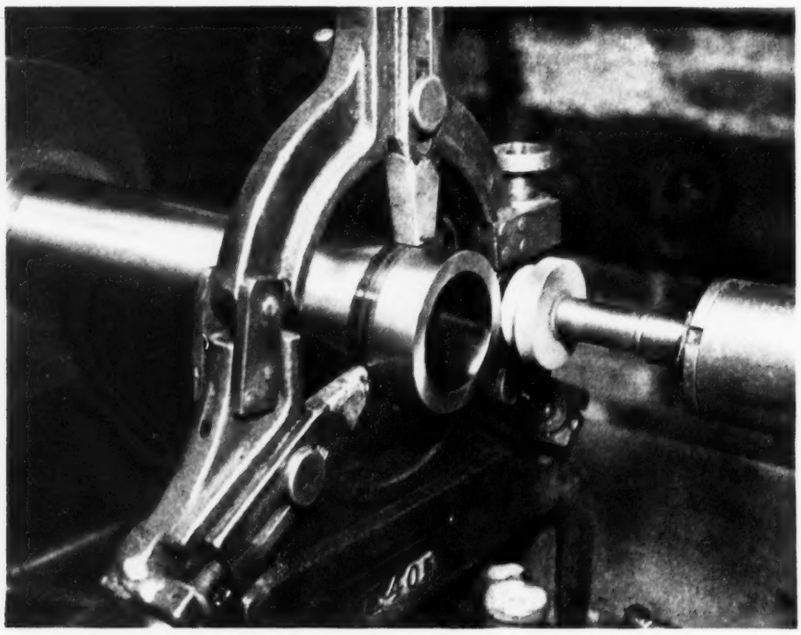


Fig. 10. Squareness of the Ends of Liners in Relation to the Bore is Insured by This Grinding Operation

shown in Fig. 7, to prepare them for the finish-boring operation and to provide a suitable surface for determining the hardness. Boring follows on a six-spindle machine similar to the one shown in Fig. 3, after which the liners pass through hydraulic testing, honing, outside finish-grinding, and finish-facing operations similar to those performed on liners of regular cast-iron.

The "Super-Service" steel liners are sawed to the approximate length from alloy seamless steel tubing and then turned, rough-bored, normalized, semi finish-bored, finish-bored, carburized, and hardened before they reach the external grinding operation shown in Fig. 8. For this operation, the liner is mounted on an arbor that fits the finished bore. It is clamped on the headstock end by means of an air-operated chuck. Rough-, semi-finish-, and finish-grinding cuts are taken on the external surface.

These liners are next ground on the inside in an internal grinding machine equipped with a fixture that is provided with adjustable stops for locating the work accurately from its ground external surface. From 0.001 to 0.0015 inch of stock is left on the diameter for removal by honing. Prior to the honing operation, an internal grinding machine equipped as illustrated in Fig. 9, is employed for rounding the inside corner of the bore at each end of the liners, so as to prevent damage to the abrasive stones of the honing tool. After honing and

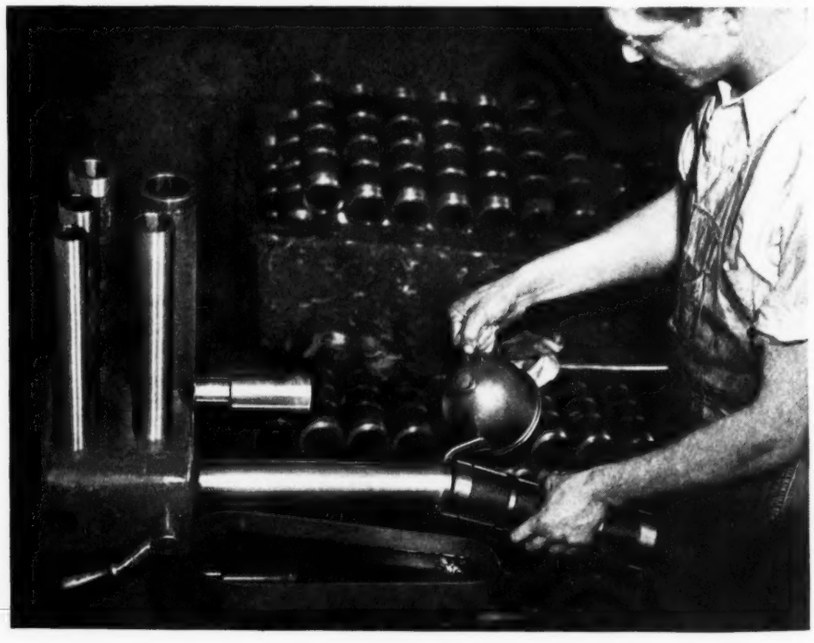


Fig. 11. Both "Go" and "No Go" Plug Gages are Used to Insure the Required Accuracy in Liner Bores

Fig. 12. Indicator Gage Used to Determine the Accuracy of Bores as to Diameter and Roundness Over the Entire Length

finish-grinding of the outside surface, the end faces of the liners are ground square with the external surface, as illustrated in Fig. 10.

An inspection stand used for checking the bore of the liners is shown in Fig. 11. In the foreground is the long "Go" gage, and at the back the shorter "No Go" gage. The latter is relieved slightly at the forward end to facilitate proper alignment of the liner with the gage. Liner bores are also checked with the indicator gage seen in Fig. 12, which has two fingers at one end of a long rod that are moved the full length of the bore. At the same time, the work is revolved on ball bearing rollers, so as to obtain an accurate reading all around the bore. Variation in diameter and roundness is indicated by the dial gage fastened to the end of the rod opposite the gage fingers. Other types of gages are employed for checking the outside diameter, straightness, and length of the pump liners.

In the second installment of this article, the operations required in making the plungers for the Axelson pumps will be illustrated and described, as well as operations pertaining to the valve seats.

Heating and Heat-Treating Furnaces for Munitions Manufacture

TO meet the demands for the manufacture of munitions, a great number of heating and heat-treating furnaces will be required. The Industrial Furnace Manufacturers Association, 420 Lexington Ave., New York City, has issued some suggestions that, if followed by furnace users, would aid in preventing furnace requirements from becoming a "bottle neck" at a later date.

These suggestions are as follows: (1) Place orders for furnaces just as soon as it is known that such equipment will be required. (2) Do not insist on shorter deliveries than necessary; this will aid the furnace manufacturers in making deliveries to all customers to meet the needs. (3) Utilize, whenever possible, established successful designs.

In cases where furnace equipment has already been ordered, review the delivery dates, and if for any reason the furnace will not be required at as early a date as requested, notify the furnace manufacturer that he may extend the delivery time. This will enable the furnace manufacturers to meet the requirements of other furnace users who may need more immediate deliveries.

Furnace manufacturers have found, in some instances, that when they delivered a furnace as promised, even the building that was to house it had not been completed. In other cases, the forging hammers to be used in connection with the furnaces were not to be delivered for another thirty to sixty days.

If customers for furnace equipment will cooperate with the manufacturers in regard to delivery dates, the whole industry will benefit. It is of great importance, however, that the order be placed immediately, even though delivery may not be required for months to come.

Unusual Tool Set-Up Overcomes Chatter in Turning Slender Shafts

By PHILIP M. McKENNA

Many methods have been devised to overcome chatter when turning long, slender shafts. The most common procedure is to support the work with a steadyrest or a follow-rest, but sometimes even that fails to overcome vibration.

An ingenious method of overcoming chatter was discovered recently in a job shop required to turn shafts from 0.35 carbon steel, 1 7/8 inches in diameter, and 49 1/2 inches long. The unusually high ratio of length to diameter, together with the carbon content of the steel, produced a springy workpiece which was difficult to keep from vibrating.

The first operation was to reduce the diameter of the shafts to 1 1/2 inches, using a three-pin steadyrest in the middle of the shafts. High-speed steel bits were used at first; but the stock proved so hard that two hours was required to complete this operation, and the steel bits wore rapidly, even at slow cutting speeds.

Next, a Kennametal-tipped tool was tried. This tool, made by the McKenna Metals Co., Latrobe, Pa., had a 5/8- by 1 1/4-inch shank, a 20-degree side cutting-edge angle, a 6-degree side rake, a 6-degree clearance, and a 1/64-inch nose radius, with a chip curler ground in the tip. However, despite the steadyrest, the work still chattered and slowed down.

It so happened that the shop had on hand a left-hand Kennametal tool which had been used for facing operations. This tool was put upside down in the toolpost, and the lathe was run backward as indicated in the illustration. With this arrangement, there was no vibration or slowing down of the work, and a bright finish was produced. Furthermore, the cutting speed could be so greatly increased that the machining was completed in fourteen minutes instead of two hours. Two cuts of seven minutes each were taken, using a 3/32-inch depth of cut, a 0.015 inch feed, and a cutting speed of 280 R.P.M. It is suggested that placing the tool upside down and running the lathe backward might be applied on other jobs where long slender work must be turned.

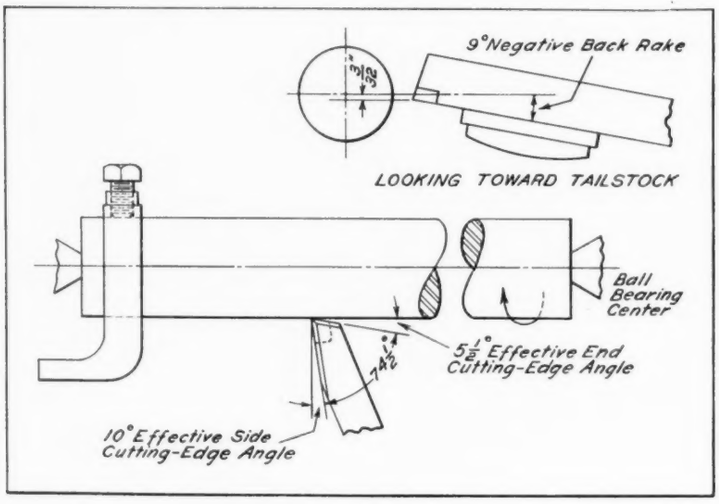


Illustration Showing Tool Angles and Setting of Tool

* * *

High-Quality Steels for Machine Tools

In a recent number of the *Moly Matrix*, published by the Climax Molybdenum Co., New York City, attention is called to the progress in the art of cutting metals that has been made in the last forty years. In 1900, an average of 1/4 pound of metal could be removed by machine tools per minute; in 1935, lathe tools were reported to have removed 17 pounds of chips a minute. Progress in machine tool design and improved cutting tools may have stepped this up even further in the last five years.

Extremely high spindle speeds have recently been introduced in lathes and other machine tools to take advantage of the cutting possibilities of the carbide tools. One reason why such high cutting speeds are permissible is that advances in design and materials have greatly improved the rigidity, toughness, and wear resistance of machine tool spindles. The spindle forgings for the Pacemaker lathe, built by the American Tool Works Co., for example, are made from a chromium-molybdenum steel (S A E 4145) of approximately the following analysis: Carbon, 0.40 to 0.50 per cent; manganese, 0.60 to 0.90 per cent; chromium, 0.80 to 1.10 per cent; and molybdenum, 0.15 to 0.25 per cent. This steel is also used for gears.

Through heat-treatment, this type of steel may be given a strength and toughness approximately as follows: Tensile strength, 260,000 pounds per square inch; yield strength, 235,000 pounds per square inch; reduction of area, 33 per cent; elongation in 2 inches, 9 per cent; and Rockwell C hardness, 50 to 52.

* * *

The gage industry is extremely active at present, largely as a result of the National Defense Program. Reports from individual manufacturers indicate an output from double to six times that of last year. The demand for gages is taxing the production resources of practically all gage manufacturers. There is a tendency among users to specify gages with longer life than the conventional type, such, for example, as chromium-plated gages or those provided with cemented-carbide gaging faces. Despite the higher cost of these gages, they not only make for economy in the long run, but also relieve the strain on the country's gage-production capacity.

Douglas Builds the World's Largest Airplane

How Parts are Produced for a Super-Bomber and for Regular Military and Commercial Planes—Second of Two Articles

By GEORGE A. STROMPL
Factory Manager
Douglas Aircraft Co.

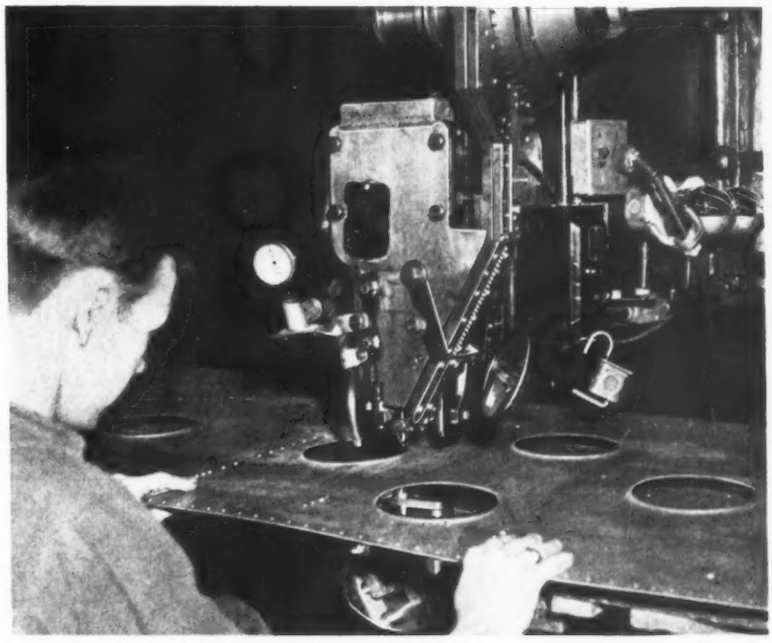


Fig. 12. Automatic Punching and Riveting Machine Equipped with Mirrors for the Convenience of the Workman in Observing the Operation

TYPICAL operations in building parts for an airplane having a wing spread of over 210 feet and a gross weight of 70 tons fully loaded, as well as for planes of the types regularly produced by the Douglas Aircraft Co., Inc., Santa Monica, Calif., were described in the first installment of this article, which appeared in July MACHINERY, page 146. The present installment will describe additional operations performed in the same factory.

An Erco automatic punching and riveting machine of the C type, similar in operation to the one described in the first installment, but intended for use on smaller work, is shown in Fig. 12. This machine has a throat of 36 inches. An advantage of this type of equipment is that the operator can sit close to the punching and riveting tools. Mirrors are provided both above and below the work to enable the operator to observe the rivet-feeding mechanism and the performance of the punch beneath the work.

An Ex-Cell-O boring machine used on a variety of landing gear parts, engine nacelles, etc., is shown in Fig. 13. Ordinarily, both heads of this machine are employed for taking boring cuts from opposite ends of the work. In the set-up illustrated, however, the work is mounted on one head and the tool on a universal fixture that adapts the machine to the handling of limited quantities of similar work. With this arrangement, the work revolves and the tool remains stationary, which is the opposite of the conventional practice on this type of equipment. The customary limits on work turned out by this machine are plus or minus 0.0002 inch.

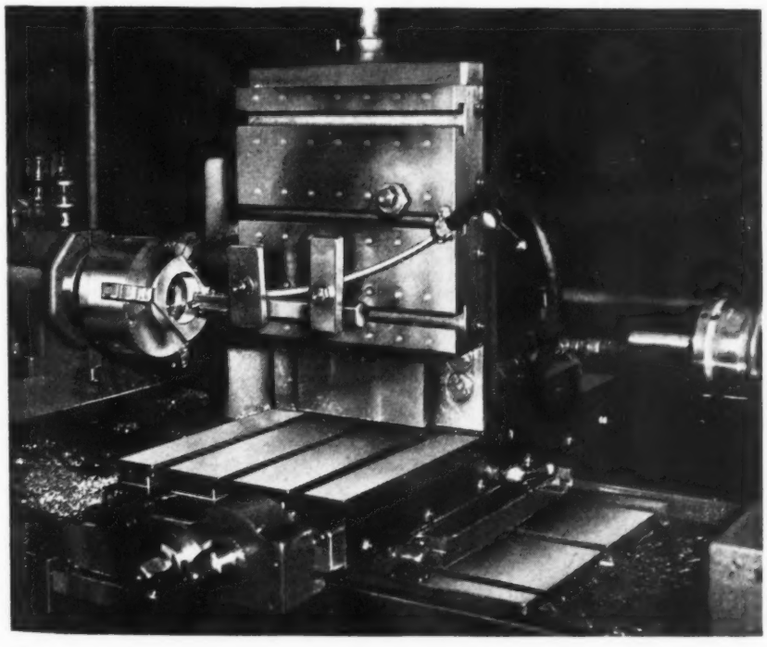


Fig. 13. Precision Boring Machine Equipped with a Universal Fixture which Readily Adapts the Machine to the Handling of Limited Quantities of Work

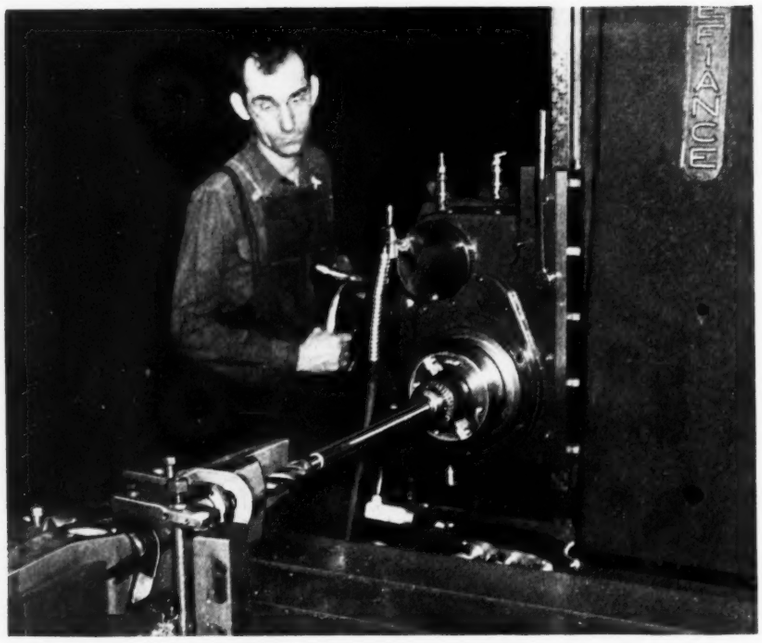


Fig. 14. Typical Operation Performed on a Horizontal Boring, Drilling, and Milling Machine, Used for Machining Landing Gear Parts, Engine Nacelles, and Other Work

The same class of work is bored, milled and drilled on the Defiance horizontal boring mill shown in Fig. 14. The particular operation illustrated consists of drilling, rough-boring, and reaming a 1.250-inch diameter hole through a forging 14 inches long, which had to be straight within close limits and also in accurate relation to another hole that extended at right angles to it.

The Warner & Swasey turret lathe illustrated in Fig. 15 is tooled up for machining flap control-rod coupling sleeves from bar stock. After the stock has been advanced to a stop mounted on the first face of the turret, the stop-holder is swiveled through 180 degrees to bring a spotting drill into line with the work. When this drilling operation has been completed, the turret is indexed to bring another drill into line with the work, which drills a hole the full depth of the part. The third turret face is equipped with a larger drill, the fourth and fifth faces with reamers, and the sixth turret face with a bottoming drill. While operations with these tools are in progress, a tool on the rear of the cross-slide is advanced for knurling the part. The part is finally cut off by a tool at the front of the cross-slide.

There are a number of milling machines in the machine shop, including the Linley high-speed milling machine shown in Fig. 16. The illustration shows this machine milling a slot in the end of a small stud held at right angles to the milling cutter by a special dividing head.

* * *

Power and Mechanical Engineering Exposition

The fourteenth National Exposition of Power and Mechanical Engineering, which will be held at the Grand Central Palace, New York City, December 2 to 7, covers specifically machinery, equipment, and devices in power plant engineering, heating installations, and materials-handling equipment. There will be more than 290 exhibitors, and approximately 1200 different products on exhibition.

The exhibits cover such classifications as combustion apparatus, boilers, heaters, piping, valves, steam plant accessories, refractories and insulation, instruments, transmission apparatus, electrical apparatus, materials-handling equipment, air-conditioning and refrigeration apparatus, metals used in power plant equipment construction, and power plant specialties.

There will also be an exhibit of portable electric tools, contour-cutting machines, electric markers and etchers, soldering tools, blow-torches, forge and electric rivet heaters, electric welding equipment, and saw-sharpening machines.

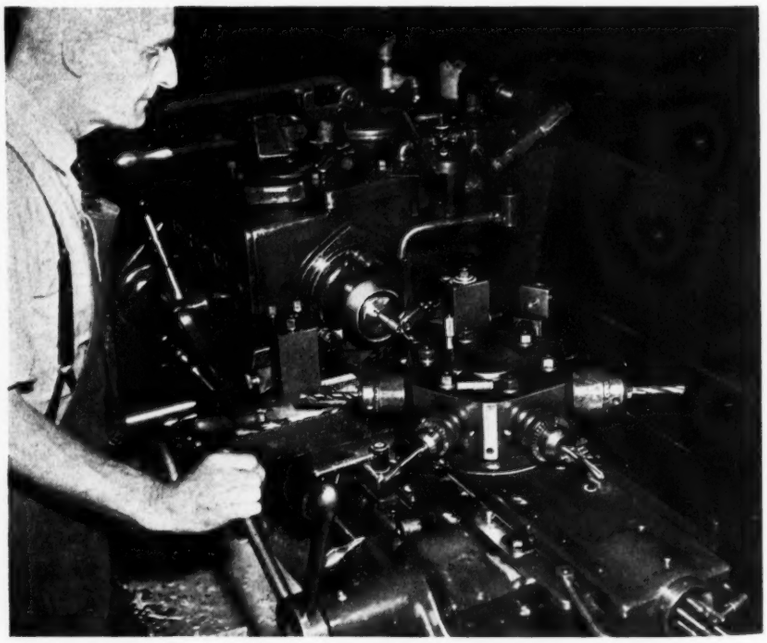


Fig. 15. Turret Lathe Tooled up for the Production of Flap Control-rod Coupling Sleeves from Bar Stock

Fig. 16. Using a Light High-speed Milling Machine for Milling a Slot in a Small Stud Held at Right Angles to the Milling Cutter by a Special Dividing Head

Exports of Industrial Machinery During September

According to the Machinery Division of the Department of Commerce, Washington, D. C., the United States exports of industrial machinery during September, the last month for which complete statistics are available, amounted to $36,891,000. The exports of power-driven metal-working machinery reached a new high level, amounting to $22,452,000. The value of the shipments of machine tools to England was $15,070,000, compared with $12,481,000 in August and $7,955,000 in July. The exports of power-driven metal-working machinery to the Soviet Union amounted to $895,000 in September, compared with $1,796,000 in August.

Of the machine tools exported during the month of September, $4,681,000 represented milling machines; $3,882,000, engine, automatic, and turret lathes; $3,118,000, grinding machines; and $1,394,000, drilling machines.

* * *

Machine Tool Exports to Japan

According to statistics published by the Machinery Division of the Department of Commerce, the value of machine tools exported from the United States to Japan during 1939 amounted to $19,810,000. These exports showed an increase during the first six months of 1940, when they totaled $10,730,000. The high rate continued during July and August, when the exports amounted to $1,322,500 and $1,875,500, respectively. Japan is reported to be making every effort to build up her domestic machine tool industry. Substantial subsidies are granted by the government for the development of new types of machine tools.

* * *

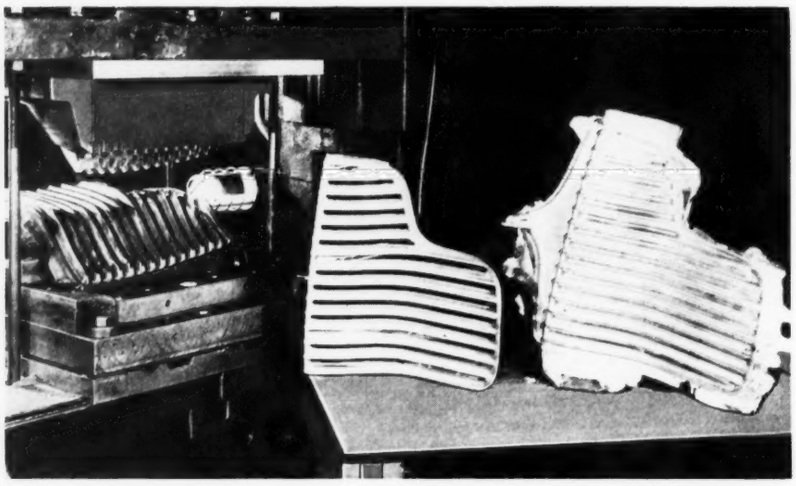
Horizontal Boring Operation on Airplane Work

The machine shop at the plant of the Boeing Aircraft Co., Seattle, Wash., is engaged in machining the various castings and forgings required on airplanes, outside of the engine. A typical operation in this department which consists of finish-boring a landing gear part for a Stratoliner on a Lucas horizontal boring mill, is shown in the accompanying illustration. The operator is seen checking the setting of the boring tool.

With the extension of air-conditioning, there is a widening field for thermostatic bi-metals used to control temperature. For these controls, use is made of nickel-iron alloys containing 36 to 45 per cent nickel for the low expansion side, and 20 to 70 per cent nickel for the high expansion side.

Typical Operation in the Boeing Machine Shop, which Consists of Boring a Landing Gear Part for a Stratoliner

Advanced Practice in Polishing



Close-up View of Die Mounted in Press for Shearing Flash from a Buick Radiator Grille Casting. On the Table at the Right are Shown Castings as They Appear before and after Flash Removal

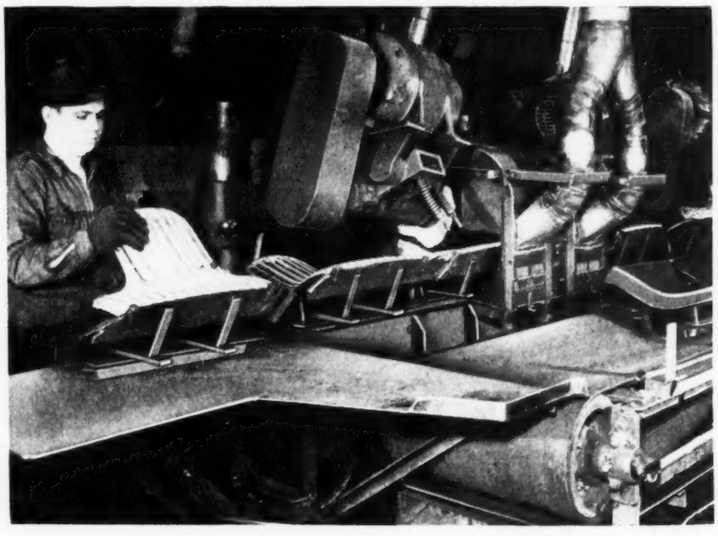
The Ternstedt Manufacturing Division of the General Motors Corporation has Applied Highly Developed Methods for the Buffing and Plating of Die-Castings

By HERBERT CHASE

EXCEPTIONALLY efficient practice has been developed for preparing enormous quantities of zinc-alloy die-castings for plating, as well as for the subsequent plating procedure, at the Ternstedt Manufacturing Division of the General Motors Corporation, which manufactures automotive hardware for the Corporation's Fisher Body Division. Upward of a hundred tons of such castings are handled a day, and as many of them are small hardware parts, the total number is great. There are, too, a great number of large castings, such as radiator grilles, as well as many of intermediate size, including radio grilles and glove compartment doors, to be plated. Castings subjected to outdoor exposure are copper-, nickel-, and chromium-plated, and those for interior use are plated with nickel and chromium. All must meet exacting specifications, and the product must be turned out in sufficient quantities to keep step with car and body production schedules in many plants. This necessitates not only close control and efficient methods, but excellent equipment as well.

The castings flow continuously from the die-casting department on two chain conveyors. The larger castings hang from hooks on one conveyor. Most of the flash is sheared off in trimming dies in large presses, but grille castings require some hand-filing to take off fine flash and to smooth the parting lines. This is done in bench fixtures at relatively few stations, and with the castings passed along from station to station until they reach a drill press where holes are tapped, after which the castings are again hung on a chain conveyor. The latter carries them past buffing equipment, where operators remove them and buff surfaces not reached on automatic straight-line buffing machines to which the castings are shortly delivered, after being returned to the conveyor.

Upon arrival at the straight-line buffing machines, the castings are taken from the conveyor and are placed on forms or holders for passage along the track of the machine, which buffs the front or main surface exposed in service. This applies to the two halves of Buick and Pontiac grilles which come through at the rate of about 70 or 75 pieces an hour. The curved surfaces to be buffed pass successively, as the grilles are advanced along



Loading End of the Machine in which Buick Radiator Grilles are Polished and Buffed. The Operator is Loading a Grille in a Carrier which Passes under Several Wheels as it Advances along a Track

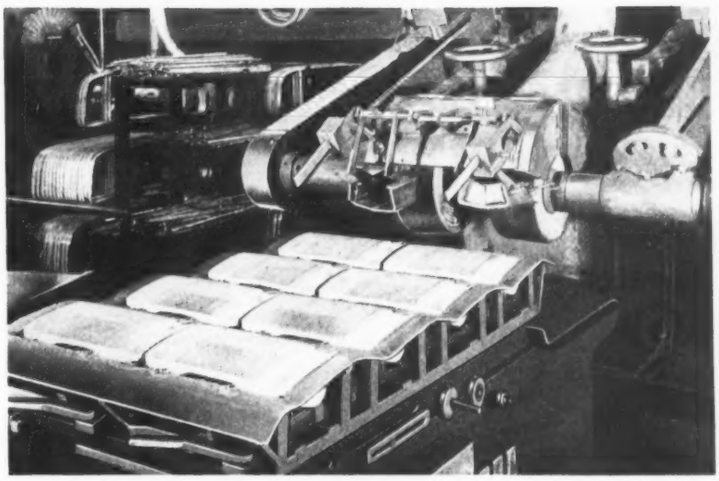
and Plating Die-Castings

the track, under wheels (about a dozen in all) set to buff the entire surface uniformly. No grinding or polishing of the main surface is required, since it is cast with remarkable smoothness and is ready for buffing.

At the end of the buffing machine, the grilles are removed and the buffing fixtures are returned (automatically on one line and by belt on another) to the loading end of the machine. Each grille is inspected, and if any defects are found, it is passed to hand-buffers for touching up. The grilles are then ready for plating.

Castings of medium size follow a similar course, but each along its own line. The Olds radio grille, for example, has the edges hand-buffed—that is, guided by hand against a power-driven buff—and is then put on an automatic machine which has a reciprocating table with mountings for several grilles. The grilles, on holders, pass under buffing wheels mounted on pivoted arms which move the wheels transversely, besides permitting them to rise and fall so as to follow the curved surface being buffed. Pontiac glove doors are buffed on a rotating table while held in fixtures which bring them successively under six different buffs. There are eight fixtures on this table, one under each of the six wheels and the remaining two in position for loading and unloading in a continuous cycle.

Thousands of small castings pass every hour through automatic buffing equipment, a large proportion being door-handles, window-regulator cranks, etc., most of which are fitted into special carriers on conveyors which advance under buffing wheels set to reach all surfaces that need buffing.

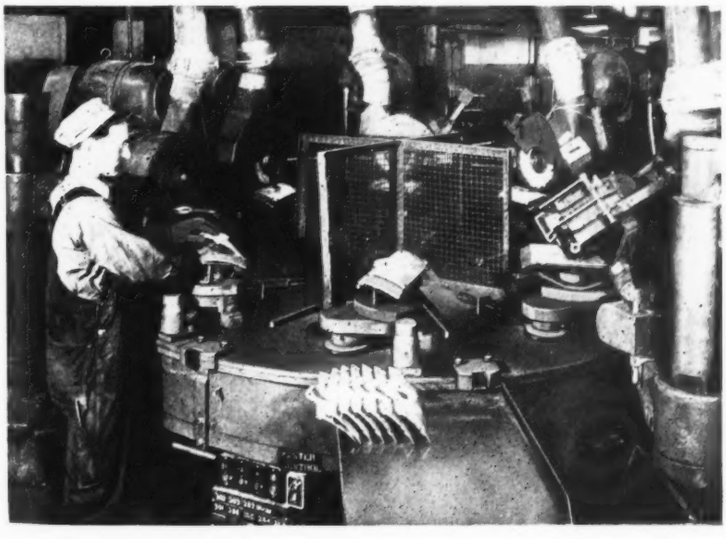


Close-up View of Machine on which Eight Die-cast Grilles are Polished and Buffed. The Wheels are so Mounted that They are Free to Rise and Fall as the Work is Reciprocated under Them

One unusual set-up for regulator cranks employs a cast-iron wheel which turns slowly in a vertical plane, and has numerous small holders on its periphery. The cranks are mounted in a radial position, and pass first under a grooved buff which fits the rounded end, polishing over an arc of 180 degrees.

The cranks then pass between a pair of emery belts running over buffs which serve in place of pulleys. The buffs support the belts, but permit them to yield, so as to conform to the irregular shape of the crank and polish off the parting line extending down each side. This rapidly polishes a surface that could not be polished at so high a rate if the pieces were guided by hand. After passing the belts, the parts return to the loading position, where they are taken out and replaced by other parts. The operator merely loads and unloads the fixtures, taking the cranks from one chute and putting them in another after they are polished.

Several small castings, which are not prominent when installed in the car or which are used on commercial vehicles, are ball-burnished instead of being buffed. The burnishing is done wet in soap solution with steel balls of such a size (1/8 inch diameter and upward) as to reach all surfaces to be burnished. The burnishing barrels are about 30



Pontiac Glove Doors are Placed in Carriers which Rotate with the Circular Table and are Carried Successively under Several Polishing Wheels, after which They are Returned to the Reloading Position

inches in diameter and are wood-lined. They are driven at about 13 R.P.M., and take a charge of, perhaps, 500 to 1000 small castings, depending on the size of the pieces. The charge, with balls and castings, water, and about 30 cubic inches of soap flakes and 2 ounces of sodium cyanide, fills about one-third the volume inside the barrel.

The burnishing requires from 20 minutes to 3 hours, depending on the shape of the piece and the burnish needed. This burnishing is not equal to a buffed finish, of course, but leaves the casting smooth and bright enough to take a plated finish that is satisfactory for the location and service required, and reduces the finishing cost. The burnished castings are then ready for plating, the same as buffed parts.

Both buffed and burnished castings are transferred immediately to the plating departments, where the smaller ones are strung on copper wires and the larger parts placed in racks. All plating is done on automatic conveyors which are timed to give the required length of time in each tank. As already indicated, castings for interior use are nickel- and chromium-plated directly on the zinc. Castings for exterior use are first plated with copper, then with nickel, and, finally, with chromium.

The castings are separated, of course, for these different treatments, and there are separate conveyors also for the smaller castings, which are strung on wires or placed in racks, and for the larger ones, which are held in racks. In all cases, the nickel-plating is bright—that applied directly to zinc is accomplished by a process developed by Ternstedt, while the nickel-plating over copper is done by the Harshaw method.

The machines employed in plating include types developed by Ternstedt, as well as others of Hanson-Van Winkle-Munning and of Stevens makes.

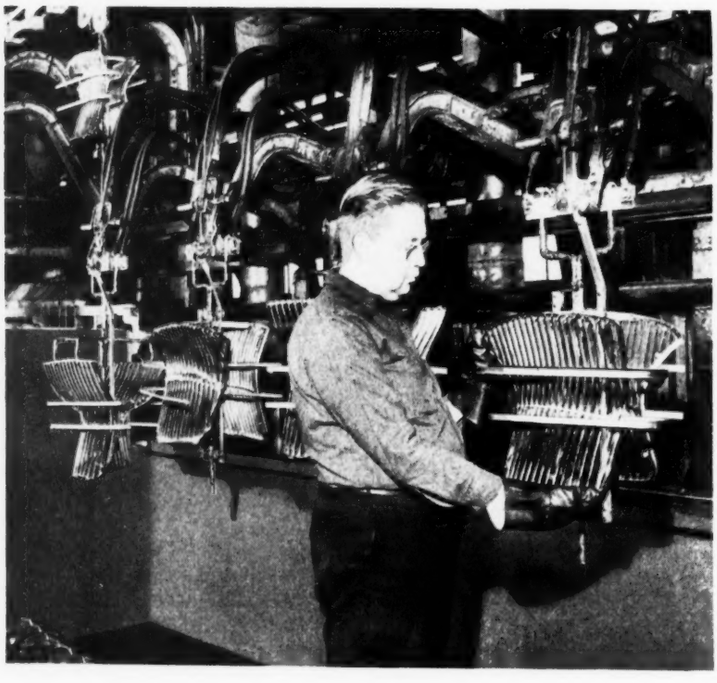
Hardware parts for interior use are carried through the following cycle: (1) String on copper wire and degrease in stabilized trichlorethylene; (2) transfer to plating conveyor; (3) dip in mild alkaline cleaner for 60 seconds; (4) rinse in water; (5) dip a second time in alkaline cleaner for 30 seconds; (6) rinse in water; (7) etch in 1 per cent solution of hydrofluoric acid; (8) plate 20 minutes at room temperature in Ternstedt bright nickel solution; (9) rinse in water; (10) dip in 1/2 per cent sulphuric and nitric acids mixed; (11) rinse in water; (12) chromium-plate 3 1/2 minutes; (13) rinse in cold water; (14) second rinse in cold water; (15) rinse in hot water.

Parts that are placed in racks follow the same cycle, but after the castings have been removed, the racks are given a dip in muriatic acid and are then rinsed in water, after which they are given a treatment in reverse alkaline cleaner, to remove chromium from them. They are then ready for use in another cycle.

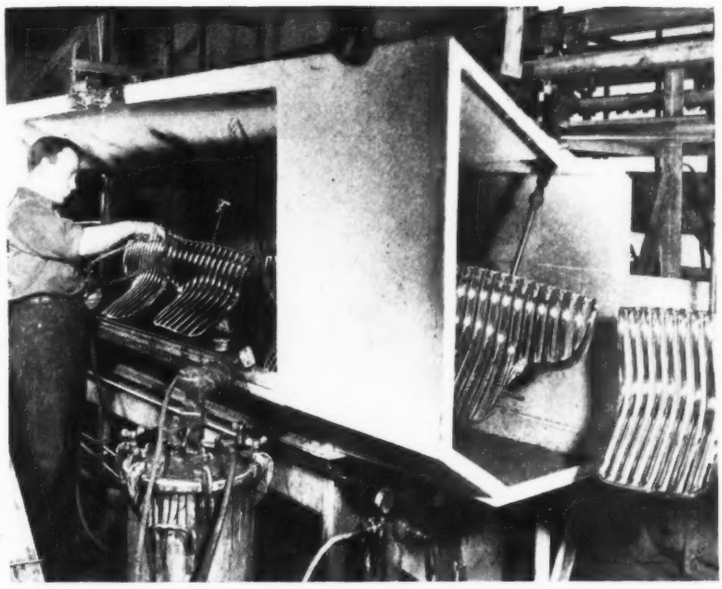
Large parts for exterior use are passed through the following cycle: (1) Place in racks; (2) pass through trichlorethylene solvent spray; (3) place racks on Hanson-Van Winkle-Munning machine; (4) dip in alkaline cleaner 5 minutes; (5) rinse in water; (6) etch in 2 1/2 per cent sulphuric acid solution; (7) rinse in water; (8) dip in reverse cyanide solution; (9) plate in copper cyanide solution 13 to 14 minutes; (10) rinse in water; (11) dip in 1 per cent sulphuric acid solution; (12) plate in Harshaw bright nickel solution 34 minutes; (13) rinse in cold water; (14) rinse in hot water; (15) remove from racks.

Although the foregoing results in a bright nickel plate, some light buffing is usually required, after which the parts are degreased in trichlorethylene, again placed in racks, and hung on a Stevens machine for chromium-plating. Grilles are plated in racks that carry a pair of nickel anodes of U-shape, bent around the grille, and a pair of vertical nickel anodes back of the grille. These racks are used only on the chromium-plating machine in which they go through the following cycle: (1) Dip in chromium cleaner; (2) rinse in water; (3) dip in 2 per cent solution of oxalic acid; (4) rinse in water; (5) chromium-plate 4 1/2 minutes; (6) rinse in cold water; (7) second rinse in cold water; (8) rinse in hot water; (9) remove from racks and inspect.

Any parts that do not pass inspec-



Subsequent to Buffing, Cleaning, and Plating with Copper and Nickel, Radiator Grilles are Again Buffed and are Then Mounted on Plating Racks for Passage through the Chromium-plating Tanks. The Racks also Hold the U-shaped Nickel Anodes which Extend around the Grilles



Booth in which the Radiator Grilles are Sprayed with Black Lacquer on the Unbuffed Surfaces after Plating

tion are given a light buff, where required, to insure uniform brightness all over the surface exposed in use. The grilles are then hung on a conveyor which carries them to a spray booth, where they are sprayed with black lacquer from the back while the face is masked. Any excess lacquer that gets on the buffed face of the part is removed by wiping with a soft cloth moistened in solvent, and any bare surfaces that should be black are touched up by hand.

The grilles then proceed along a chain conveyor through an oven having a temperature of 185 degrees F. for 70 minutes. When removed, studs are driven into untapped holes on the back face, using a special fixture and a special chuck. An automatic hopper feed supplies the studs to the drive chuck. After final inspection, the grilles are ready for shipping.

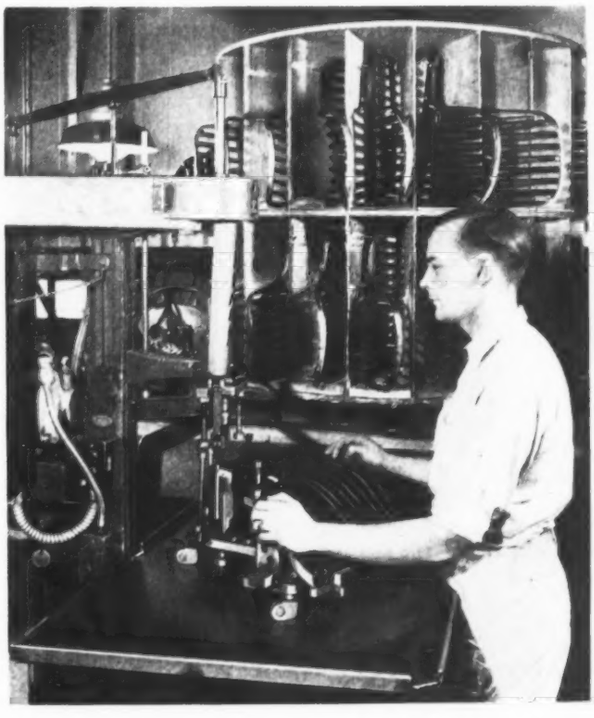
Castings other than grilles subjected to exterior exposure are put through a somewhat similar plating treatment, but the smaller parts are chromium-plated in Ternstedt machines of a design that has racks permanently attached to the conveyor. Many castings receive a coat of lacquer on the rear surfaces, and some have depressed areas which have to be filled in with colored lacquer which is applied with special low-pressure guns or "pencils" held in contact with the surface. Some lacquer is also applied to plated surfaces with spray guns, masks being used to keep the lacquer off surfaces where it is not wanted. A few castings require plastic inserts which are applied and fastened by fusing.

New Design of Shell-Turning Machine

A machine capable of turning a shell a minute has been designed for the Army Ordnance Department by the machine tool industry. A test model is now in operation in the plant of the Studebaker Corporation at South Bend, Ind.

About a year ago, Army Ordnance officers asked a committee of the National Machine Tool Builders Association whether the Association would undertake the work of designing a line of single-purpose machines for turning shells—machines that would be inexpensive, could be built quickly in substantial quantities, and would produce shells when run by untrained operators. The machine tool industry immediately undertook the task and completed the designs during the summer.

The Studebaker Corporation has built the first of these machines and has it in operation. The reason for having these machines designed was to insure, in the event of war, that the Ordnance Department would have on hand a tested design which could be built by any machine manufacturer equipped for this type of production. Thus there would be a broad source of supply and the Ordnance Department would be able to obtain shells in large volume with a minimum delay.



Machine Provided with a Head that Screws Studs into Untapped Holes on the Back Face of Radiator Grilles. The Studs are Fed Automatically from a Magazine. The Grille is Mounted on a Carrier, the Frame of which is Notched under Each Stud Boss. When Pins in the Table Enter These Notches, the Grille is in the Correct Position for Driving a Stud

Engineering News Flashes

Photo-Electric Cells Used for Controlling Bessemer Blow

In a paper recently read by H. W. Graham, director of metallurgy and research of the Jones & Laughlin Steel Corporation, Pittsburgh, Pa., before the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers, attention was focussed on the patents granted on a method for controlling the Bessemer blow in steel-making by an arrangement of photo-electric cells and other instruments which eliminate the human element in determining the all-important end-point of the blow. The invention has been termed the first basic improvement made in the Bessemer process since its inception.

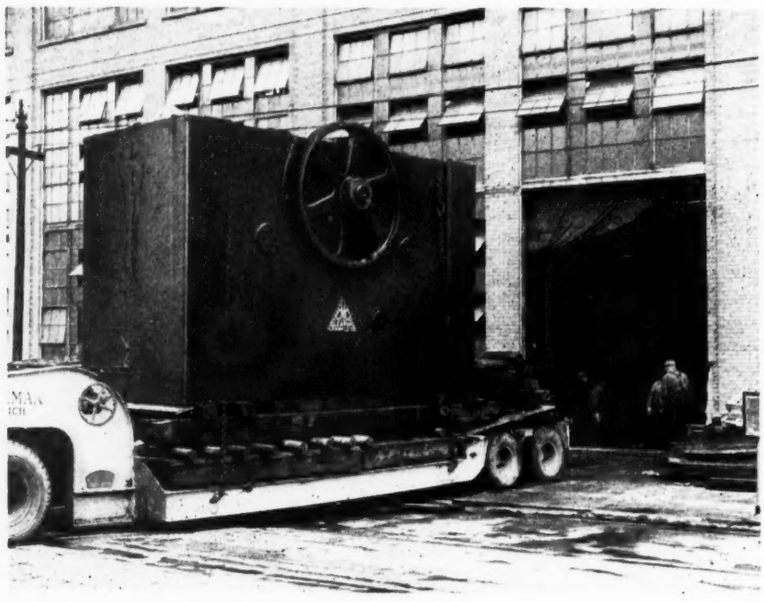
Several steel producers are now negotiating licenses for the use of this method. It is believed that the new method will form the basis of much metallurgical work during the next decade for developing and improving the Bessemer process, to restore it to its former important place in the economics of the steel industry. Of immediate interest are also the possibilities for increasing steel production in the United States by making greater use of the existing Bessemer steel-making facilities, and at the same time conserving the supply of scrap. The important point in this connection is that by making full use of the available Bessemer capacity, it will be possible to step up the production of the steel industry without resorting to the slow and costly procedure of constructing additional steel-producing facilities.

Mr. Graham stated that, as a result of many tests, it was found that the end-point of the flame has a direct bearing on the quality of the steel. The yield of good material is highest when the blow is stopped at the proper time. By varying the time of the after-blow a matter of a few seconds, the desired quality of the steel can be predetermined at will.

Noise Measuring has Become Important in Many Industries

A new portable device for measuring sound or noises, known as a sound-level meter, has been developed by the General Electric Laboratory at Schenectady, N. Y. This device is lighter and more compact than any previous instrument of this kind. It weighs only 19 pounds, but has a range of from 24 to 120 decibels (the unit employed for measuring the intensity of sound). This range is roughly from the rustle of leaves to the screaming of a factory whistle.

The new meter can be quickly and conveniently applied to almost any kind of noise study, including airplane engines, propellers, motors, fans, generators, turbines, pumps, bearings, gears, and any other parts of industrial machinery. It is especially applicable where a great many measurements may be required in a brief period of time. A vibration-velocity unit can be substituted for the microphone on the instrument, so that vibration as well as noise can be measured.



To Install a Number of Big Presses in the Buick Sheet-metal Plant, a Whole Section of the Factory Wall had to be Knocked out. The Illustration Shows the 52-ton Crown of a Press being Moved in. Fully Assembled, the Press Weighs 135 Tons

American Aviation Industry has Entered the Mass-production Stage, as Evidenced by the Accompanying Illustration, where Thousands of Steel Cylinder Barrels are Stacked, Row on Row, in the Plant of the Wright Aeronautical Corporation at Paterson, N. J. Each Single Cylinder Barrel Develops More than 125 H.P.—a Greater Power Output than the Complete Engine of the Average Automobile

Hammered Metal Effects Produced by New Coating Finish

Finishes resembling hammered silver, copper, bronze, and other ornamental metals can be applied to products made of any kind of metal, and also to molded plastics, by the use of a new type of finish known as "Hammertone," which has recently been developed by the Maas & Waldstein Co., Newark, N. J. In finishing a surface with Hammertone, a base coating of the desired color is first sprayed on. This is followed immediately by a spatter coat of the Hammertone liquid, which produces the hammered pattern in the base coating. The product is then baked at medium heat for an hour. The result is a lustrous metallic finish, very tough and durable. The finish is suitable for metal novelties, heating units, air-conditioning equipment, metal cabinets and furniture, radio cases, and similar products.

Barium Used as Lubricant for X-Ray Target Bearing

The rapid rotation of an X-ray tube target in a high vacuum presents a formidable problem in lubrication, inasmuch as any vaporization of the lubricant would spoil the vacuum and render the tube useless. For some time, X-ray tubes using rotating targets were operated without lubrication. Experimentation by engineers of the General Electric X-Ray Corporation, in Chicago, with films of such metals as barium, chromium, aluminum, magnesium, and zinc indicated the practicability of their use for lubrication where organic lubricants are undesirable. Of these metals, barium proved to be the most successful in reducing friction.

In one experiment, the engineers reported, an X-ray tube anode bearing was observed to have a sound level of 87 decibels, a speed of 3100 R.P.M., and a coasting time of 12 seconds. A barium film was applied to the bearing, and in 30 seconds the sound level was reduced to 68 decibels, the speed increased to 3560 R.P.M., and the coasting time extended to 8 minutes.

Unbreakable Windows Available for Control Instruments

Unbreakable windows for many types of control instruments are now made from Vinylite clear plastic sheets. Such windows have already been made use of in a number of instruments, among which may be mentioned "Tanktrols"—automatic water-level controls for elevated tank systems; "Floatrols"—used for pump or valve control in connection with open tanks or sumps; and "Duotrols"—automatic control equipment of the water level and air volume in pressure tanks. Vinylite, which is made by the Carbide and Carbon Chemicals Corporation, 30 E. 42nd St., New York City, is not only transparent, but has good moisture resistance and permanence of form. It also resists the action of ordinary chemicals.

Newly Developed Fuel Filter for Diesel Engines

An ingenious fuel filter for Diesel engines has been developed by the engineers of the Caterpillar Tractor Co., Peoria, Ill. So efficient is this simple innovation said to be that the new filters will increase the life of Diesel injection pumps and valves by as much as 75 per cent, compared with filters generally used in the past.

The filter elements consist of a highly absorbent type of cotton yarn wound on a metallic screen, which, in turn, is wrapped with a filter paper. The parts from which the filter is made are easily removable, and so inexpensive that they are simply thrown away when dirty, and quickly replaced by a new filter. A gage mounted on the engine shows the operator when replacement is necessary.

EDITORIAL COMMENT

The tremendous strides made by the machine tool industry during the last two years were emphasized in an address made by John E. Lovely, vice-president of the Jones & Lamson Machine Co., before the annual meeting of the National Machine Tool Builders Association, of which Mr. Lovely has served as president for the past year.

Machine Tool Industry Measures up to Demands of Defense Program

During the depression years, the machine tool industry suffered more severe fluctuations than any other major industry. From a production of $185,000,000 worth of machine tools in 1929, the demand dropped to an annual average of $22,500,000 in 1932 and 1933. The output rose to $85,000,000 in 1935, and in 1937 an output of $220,000,000 was attained due to the combined increase in both foreign and domestic demand. This, again, fell to $120,000,000 in 1938, and then, with the steady increase in foreign demand, rose to $200,000,000 in 1939.

To such fluctuating demands, the industry found it necessary to adjust itself; but the real test was still to come. In 1940, on account of the large orders received from England and France and the requirements of our own National Defense Program, the machine tool industry expanded so rapidly that the shipments this year will reach the highest figure ever attained—approximately $400,000,000. Furthermore, in August, this year, the production was at an annual rate of $450,000,000, just double the rate of output of a year ago. It has been estimated that the production in 1941 will run well over a value of $500,000,000.

Great credit is due the machine tool industry for its ability to adjust itself in this manner to the increasing demand placed upon it by the present emergency. The executives of the industry have met the difficult problems of the past year in a commendable manner. At least fifty of the machine tool building concerns have enlarged their facilities by the building of additions or new plants, and all have increased their manufacturing equipment and capacity.

Production Capacity More than Doubled in a Single Year

To overcome the difficulties due to the scarcity of skilled men, extensive training programs have been adopted at great expense to the manufacturers. Young men have been taken into the plants and given thorough training for several months, being paid good wages even during the learning period, when they return but little in the form of productive work to the company. The executive staff of the plants has worked long hours in order that the required supervision might be provided in shops running two or three shifts.

An examination of the record of this industry shows that industrial leaders can be counted upon to measure up to any national emergency just as adequately as any other group of citizens.

Now that the pressure of business on manufacturing organizations in the machinery field is especially great, it is worth while to examine into all systems, methods, and operations to make sure that no unnecessary work is being done. Frequently, as organizations develop, methods and systems are adopted which, if not scrutinized at intervals, may continue to be applied when they have outlived their usefulness.

A Good Time to Weed Out all Unnecessary Work

This is likely to apply to office work more than to shop work. It is well to ask these questions with regard to the systems and records kept: If this were not done, just what would happen? If these records were not kept, would it upset the process of manufacturing? If these reports were not made and filed, would they actually be missed? If this commercial "research" work were not done, would it affect the sales? If this finish were not provided on equipment used within the shop, would it have any effect on manufacturing efficiency?

It is surprising how many systems and methods continue in use long after the purpose for which they were adopted no longer exists. This is a good time to scrutinize all work of this character and to eliminate anything that does not directly aid in the ultimate purpose of the organization—the making of a product that meets the requirements for which it is built, at the lowest possible cost.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Positive Lock for a Rack and Pinion Motion

By L. KASPER

The mechanism shown in the accompanying illustration is used on a fixture for operating the work-holding clamp. The shape of the work made it necessary to have the clamping foot enter a recess. For this purpose, the clamping foot was required to have a long stroke and be provided with a positive locking device. Side views of the mechanism employed are shown in Figs. 1 and 3, while an end view is shown in Fig. 2. Slide *A*, which carries the clamping foot (not shown), is dovetailed to a sliding fit in the stationary part *B* of the fixture.

Slide *A* is cut out to form a rectangular hole at one end. The upper edge of the hole has machined rack teeth which mesh with the teeth of pinion *D*; the pinion clears the lower edge of the hole, as shown. Pinion *D* is fixed on shaft *C*, which rotates in part *B*. Shaft *C* is so located that pinion *D* meshes loosely with the rack in slide *A*, so that there is a small amount of backlash. The reason for this backlash will be explained later.

Shaft *C* also carries bar *E*, which is shaped on its outer end to form a cam. Crank-handle *F*, which is fixed to shaft *C*, is used to operate slide *A* through pinion *D*. Slide *A* carries block *G* which supports roller *H* in alignment with cam bar *E*; the cam bar is revolved about shaft *C* with crank *F*.

The work is loaded into the fixture with handle *F* in the position shown in Fig. 1, slide *A* then being at its extreme left-hand position. When handle *F* is turned in a clockwise direction, pinion *D*, acting on the rack in slide *A*, causes the slide to move to the right. As slide *A* resists the effort of pinion *D* to move it, the backlash between pinion *D* and the rack in slide *A* is taken up in one direction, as shown enlarged in Fig. 1.

In Fig. 3, slide *A* is shown in its extreme right-hand position, at which point the work has been clamped firmly in position. It will be noted that, in this position, cam bar *E* has been rotated in a clockwise direction to make contact with roller *H*. Up to this point, the movement of slide *A* has been accomplished by the action of pinion *D* on the rack. Slide *A* now receives its motion from cam bar *E* through roller *H* and block *G*. As the rise of the cam surface on the end of bar *E* is very gradual, the effect is to produce a more powerful clamping action than would be obtained through pinion *D*.

In the position shown in Fig. 3, cam bar *E* has pushed slide *A* slightly ahead of the position it

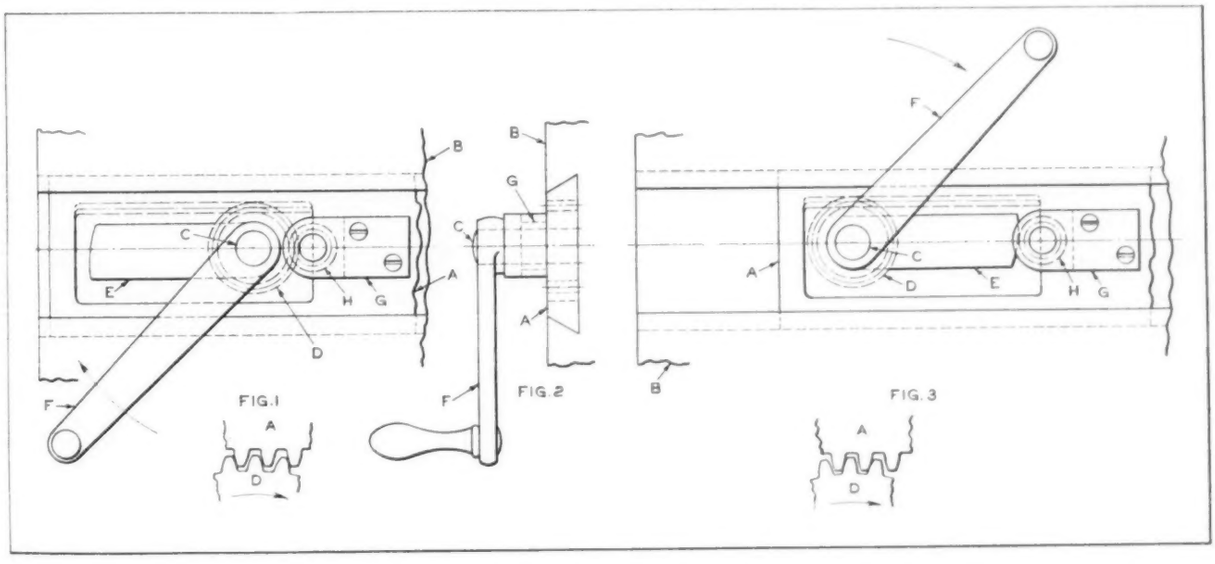


Fig. 1. Rack and Pinion Mechanism with Rack Member A Withdrawn from Clamping Position. Fig. 2. End View of Mechanism Shown in Fig. 1. Fig. 3. Member A Locked in Clamping Position by Bar E

would occupy if driven by pinion *D* at this point, so that the backlash between the gear teeth is taken up in the opposite direction from that shown in Fig. 1. This condition is shown by the enlarged view in Fig. 3. In this position, the back pressure on slide *A* cannot cause a reverse rotation of pinion *D*, as the teeth in the rack in slide *A* cannot make contact with the teeth of pinion *D* on the side that would cause reverse rotation. Slide *A* is locked firmly against the work by the wedging action of cam bar *E* between roller *H* and shaft *C*. This design provides a long quick travel of the locking slide, with positive locking, in a compact space.

* * *

Welding Jigs with Rubber-Tired Wheels for Assembling Radiator Grilles

One of the newest methods of assembling radiator grilles for 1941 automobiles by means of spot-welding was developed recently for a leading automobile company by the Progressive Welder Co., 3024 E. Outer Drive, Detroit, Mich. About 1000 stampings are assembled with 4000 spot-welds into 100 complete radiator-grille halves per hour by the specially designed welder and jigs here shown.

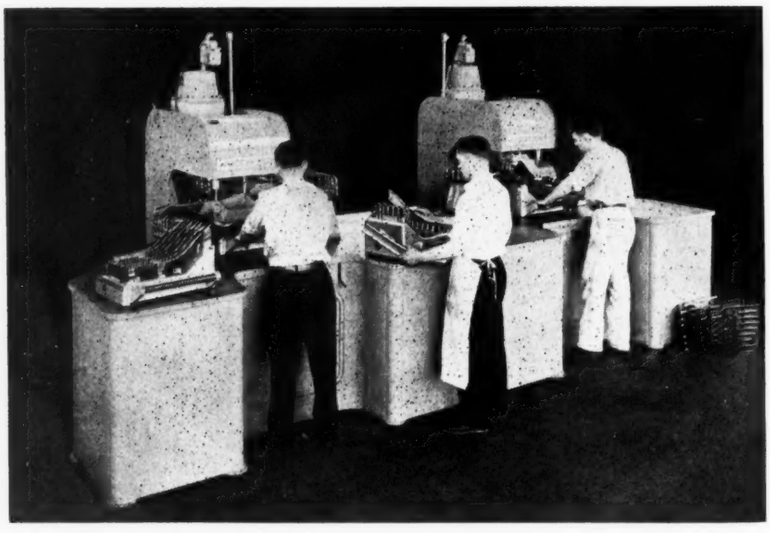
The machine has two dual welding stations; and two jigs, mounted on rubber-tired wheels, are used at each of these stations. Two men are employed at each station, each man handling one of the movable jigs which he loads, shoves into the machine for the welding operation and pulls out for unloading. Thus, while one operator is loading a jig, the second operator is welding the parts in another jig.

The component parts of one-half of a complete grille are loaded into a jig. When the wedges of the upper electrode descend, they clamp the work held in the lower electrode securely in position. An air-operated clamp having the same form as the grille presses the work in place on the welding jig and clamps the latter firmly on the table. This compresses springs which support the wheels, and permits pins in the jig to engage locating holes.

Two welding tips are mounted on each gun in such a manner that they are entirely self-equalizing and thus assure uniformity in producing two welds with each gun. The Progressive Hydr-O-Matic welding unit coordinates the welding of two guns simultaneously. The welding current passes in rapid succession from the transformer in the base of the machine through the two tips of one gun, then through the mobile jig, and back through the two tips of the second gun, thus completing four spot-welds at one time. Twenty spots in all are required for each grille half. When the welding cycle has been completed, the jig is automatically released for removal and unloading. The right grille half is welded at one station, and the left half at the other.

After an operator loads the work at the left of the station, he rolls the jig to the right and into the welding position. Following the welding, he returns to the starting position at the left; thus, the two operators at each station alternate with each other at the welding position, each loading and unloading at his own position without interference.

The jig is designed so that parts can be dropped into position, thus eliminating the necessity for fitting parts in place. While a production of 100 grille halves per hour meets present requirements, it is possible to step this up by providing additional loaders at each station, which requires no changes in the machine itself.



Welder with Dual Stations and Novel Jigs Employed to Spot-weld One Hundred Complete Radiator Grille Halves per Hour

* * *

Smaller and Lighter Motors

A national program of motor modernization has been inaugurated by the electric motor industry. This is the first important change in the original motor dimension standards adopted by the National Electrical Manufacturers Association twelve years ago. Small alternating-current polyphase, single-phase, and direct-current motors from 3/4 to 2 H.P. have been reduced in size and weight. In some instances, the weights have been reduced as much as 25 per cent, and the space occupied as much as 27 per cent, for motors having the same speed and ratings.

Smaller motors are now possible because of two major improvements: Silicon steels have been greatly improved, so that less iron is necessary to produce motors of the same horsepower; and better insulation materials have been developed, which make further reductions in size and weight possible.

Factors Affecting Welding Costs

A Detailed Study of How Labor, Electrode, and Power Costs may be Reduced to a Minimum in Electric Arc-Welding Operations

By C. M. TAYLOR, Vice-President
The Lincoln Electric Co., Cleveland, Ohio

THE factors comprising direct welding costs are labor, electrodes, and power. The labor cost depends for a particular set-up on how many pounds of effective metal are deposited per hour, or, in other words, how many minutes per hour the arc is in operation. Expressed in per cent, this time is known as the operating factor. Assuming a labor rate of $1 per hour and an arc speed of 50 feet per hour (arc speed is the actual rate of travel of the arc and may be expressed in inches per minute or feet per hour), Fig. 1 shows that maintaining a maximum operating factor assures the greatest cost reduction.

The use of proper jigs and fixtures, and correct set-up, aids in keeping the operating factor high. As an example, assume that it requires a welder two minutes to weld a job, and two minutes, or slightly less, to set it up. The time is, then, four minutes per part; or the production is 15 per hour. By providing a helper and another jig, the helper can set up while the welder is welding; the production is increased to 30 units per hour, reducing the cost materially. A production of 15 parts per hour requires a jig, a welding machine and a welder, whereas a production of 30 per hour requires two jigs, a welding machine, one helper, and a welder. The cost reduction is obvious, because the second 15 parts are produced at the cost of one jig and one helper.

Also affecting the operating factor is the matter of working position. The work should be positioned so that it is easy and convenient to weld. For example, suppose that the operator can always weld in the "down hand" position. The speed will then be, say, 26 feet per hour. If, however, it is necessary to weld in the "fillet" position, the speed may be only 11 feet per hour.

Assuming that the most favorable set-up has been devised (and this factor is kept fixed), note the effect of changing arc time by means of electrodes. Assume four arc speeds (20, 25, 30, and 40 feet per hour) for different sizes or types of electrodes, the set-up time being the same (2 hours) in each case, to produce a unit of, say, 100 feet of welding. The arc time is 5, 4, 3.3, and 2.5 hours, respectively, for the speeds given; the total time

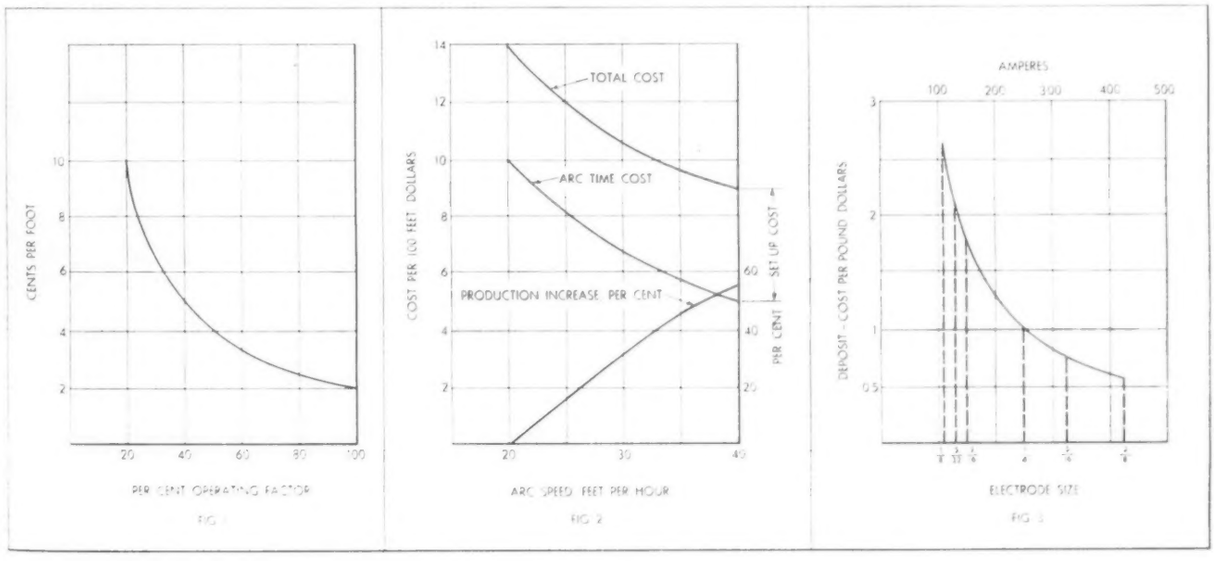


Fig. 1. Chart Showing Effect of Operating Factor on Costs

Fig. 2. Chart Showing Effect of Arc Speed on Costs

Fig. 3. Effect of Current and Electrode Size on Costs

7, 6, 5.3, and 4.5 hours; the cost (at $2 per hour) $14, $12, $10.60, and $9. There is a marked increase in production (17, 32, and 55 per cent, respectively) with no increase in equipment or floor space. These production increases account for cost reductions of $2, $3.40, and $5, respectively. The factors are plotted in Fig. 2.

Effect of Electrode Size on Costs

Consider the effect of electrode size on the cost of deposited metal. Assume that all factors, including deposition efficiency (ratio of amount of deposited metal to total electrode consumed), type of joint, and all other items, except the electrode size, are fixed. Labor is $1 per hour; power is $0.02 per K.W. hour; operating factor (ratio of arc time to total time) is 50 per cent; overhead is 100 per cent; and deposition efficiency is 66 2/3 per cent. Comparing 1/8-inch and 3/8-inch sizes, there is a difference of $2.011 in cost per pound deposited, the cost for the 1/8-inch size being $2.564, and for the 3/8-inch size, $0.553. See Fig. 3.

Cost reduction is not the only benefit obtainable by using the largest size electrode practicable. An improvement in the quality of welding is often assured, especially where multiple passes are used. The distortion of the joint is less with the smaller number of passes required in using larger electrodes.

Controlling stub-end losses, which are part of the electrode cost, effectively reduces costs and is easily accomplished. The cost per pound deposited for stub-end losses of 2, 4, 6, and 8 inches in a 1/4-inch electrode, 14 inches long, is $0.996, $1.030, $1.089, and $1.205; in a 1/4-inch electrode, 18 inches long, $0.958, $0.986, $1.032, and $1.076.

The labor cost per pound deposited increases with larger stub-end losses, due to the greater number of interruptions and the lower operating factor, and the pounds of electrode per pound of deposit increase due to the stub-end waste. On the average, labor costs increase 3 per cent for each 2 inches above the minimum 2-inch stub-end loss.

How to Reduce Power Costs

Power costs depend on the generator, its efficiency and size, and to some extent on the operating factor. In selecting a welding generator, the most modern design available should be secured, in order to minimize costs. A comparison between a new 40-volt and an old 25-volt machine—the basis being a weld 896 inches long—showed a difference of 51.3 minutes welding time, 2.5 K.W. hour input per weld, and 1.1 inches of weld per electrode in favor of the new unit.

Such operations as attaching of nameplate, painting and sand-blasting, stress-relieving, and heat-treating, not only enter into the total cost of the product as items of cost, but are also to be considered in connection with the welding. The nameplate must be easily placed. Painting involves accessibility to surfaces to be painted; the same applies to sand-blasting.

Special consideration in preparation and welding may be required for stress-relieving and heat-treatment, so as to avoid collapse or deformation when the metal is soft, and provide support for the escape of gases. Parts should not be completely enclosed, since expansion of the air will cause deformation.

Based on the foregoing suggestions for cost reduction, the following points should be considered: Use of jigs and fixtures improves the operating factor and lowers the unit production costs; work-positioners increase the welding speed and reduce the labor cost; the use of the largest size electrode that is practicable minimizes the cost per foot of weld; care in the selection of electrodes assures the best possible performance economy; the most modern, efficient generator possible reduces power costs and increases speeds; easy accessibility for painting, sand-blasting, and attaching of nameplate minimizes finishing costs.

* * *

Plastic Materials in 1941 Automobile Models

Plastic materials are being used to a greater extent than ever by the automobile industry. A glass-like transparent plastic is now being used for instrument panel lenses on certain cars. Other types of plastics are being employed to embellish the one-piece steel window moldings of the new "unisteel" turret top bodies of General Motors cars. Plastics are also used to decorate knobs of window regulator handles and cranks controlling the operation of no-draft ventilation systems, as well as for dome and courtesy light lenses. Other uses to which plastics are being put include steering wheels, fog lamp shells, stop lights, direction signals, and radiator ornaments. Experiments are also being made looking toward the use of plastics for radiator grilles.

* * *

Back of Our National Strength and Security Stands the Machine

In a booklet entitled "The Dynamics of National Strength and Security," published by the Farrel-Birmingham Co., Inc., Ansonia, Conn., it is emphasized that if we, as a nation, will appreciate fully the possibilities of increasing use of productive equipment, we can also have a corresponding expansion in the standards of living and a successful development of our National Defense. It can readily be shown that throughout our entire national existence we have progressed in almost all directions in approximately the same ratio as we have expanded the use of improved tools of production and employed machinery.

Improving the Efficiency of Drilling Equipment

By P. F. ATWOOD, Superintendent
Eagle Lock Co., Terryville, Conn.

By an analysis of such comparatively simple and common operations as drilling holes, considerable improvements can be made in the efficiency of a drilling department, as has been demonstrated in the plant with which the writer is connected.

Our equipment consists of (1) plain-bearing, foot-operated machines; (2) hand-feed machines—single- and multiple-spindle with plain bearings, and single- and multiple-spindle with ball bearings. To obtain more effective use of our machines, one of the first steps was to glue a sticker to every spindle frame, which gave the speeds available. The set-up men were then given drilling handbooks and were instructed to follow the directions given for setting up the machines in order that a speed as nearly as possible to the recommended speed be used. This plan immediately made several older types of machines obsolete, showing where more modern high-speed drilling machines were required. In some cases, the use of the obsolete machines was so costly that the savings effected through the new machines were found to pay for the equipment in three months' time.

On some machines, it became necessary to give attention to the drives, because the drill speed was reduced during drilling. On other machines, individual motors were provided on each spindle, thereby increasing the spindle efficiency. Some multiple-spindle machines had high-speed spindles substituted for the spindles being used, when the holes drilled were of small diameter and the speeds needed high. Some of the older type ball-bearing drills were refitted with the latest type bearings and then arranged for operation at double the original speeds.

An analysis of the efficiency of the twist drills used showed the advantage of employing special drills recommended for drilling specific materials, and of throwing overboard the policy of using general-purpose drills for almost all operations and all materials.

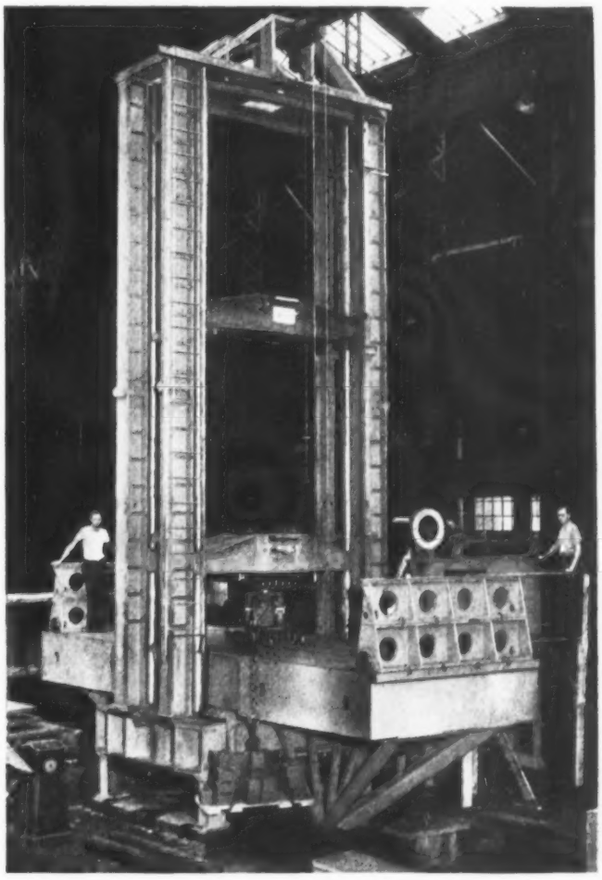
Two drill sharpeners were put into the main toolcrib, where 95 per cent of the drills are now sharpened. The installation of the first drill sharpener and a statement of the new policy brought out of hiding nearly a bushel of drills, which, when properly sharpened, were as good as new.

All in all, the changes made have resulted in a gain in daily production accompanied by reduced costs. More accurate work is obtained at less expense for drills. The use of obsolete machines responsible for high costs has been discouraged, and fewer machines are needed to produce the same output. The general ideas outlined in the foregoing can doubtless be applied with equally satisfactory results in many other manufacturing plants in the mechanical field.

Giant Riehle Testing Machine of Remarkable Accuracy

A huge materials testing machine powerful enough to bend two parallel 12-inch steel I-beams has just been completed by the Riehle Testing Machine Division of American Machine & Metals, Inc., East Moline, Ill. This machine measures 34 feet high, 21 feet wide, and 24 1/2 feet front to back. The transverse table is 8 feet wide.

The accuracy of the machine is of especial interest. Although it can exert a maximum pressure of 700,000 pounds, it is stated that it will record pressures with a maximum error of 0.06 per cent, making it one of the most sensitive machines of this type ever built. What this degree of accuracy means may be more readily understood when it is mentioned that not long ago German engineers refused to attempt to build a machine of this size to greater accuracy than 1 per cent—in other words, a machine with sixteen times greater error than the present. The machine will be used for the routine testing of materials and will also be employed as a primary standard for the verification of calibrating instruments. In routine tests, steel tubes 3 inches in diameter were crushed at 600,000 pounds pressure.



A Riehle Testing Machine Capable of Exerting a Pressure of 700,000 Pounds with a Maximum Error of 0.06 Per Cent

Increasing Production by Adequate Lighting

Requirements for Proper Industrial Lighting, and Detailed Directions for the Selection of the Right Kind of Illumination

By DEAN M. WARREN
General Electric Co.
Nela Park Engineering Department
Cleveland, Ohio

Fifty Foot-candles of Cool Blue-white Light is Provided in a Press Department by Using 85-watt RF Fluorescent Units Placed on 10 1/2-foot Centers

INDUSTRIAL progress in every direction during the last three or four decades has been based upon laboratory investigation. Even in old, established industries, the chemist, physicist, and metallurgist have revolutionized practice and displaced tradition and "rule of thumb" with new and precise knowledge gained by laboratory experiment. In the field of lighting, many facts have been discovered that can be utilized by industry to help solve the problem of how to increase production.

Hundreds of thousands of tedious observations in the General Electric Lighting Research Laboratory have proved that seeing is not simple, not instantaneous, and not effortless. In fact, seeing is a complicated and subtle process, using a large amount of nervous energy. All the skilled work done in a factory is largely seeing—noting minute imperfections, gaging to ten-thousandths of an inch, reading scales, blueprints, etc. Mistakes in seeing are costly in both materials and men.

Improved lighting helps all workers to do better work—to do their work more easily. Workers with normal vision are enabled to produce more useful work, while those with subnormal vision receive even greater assistance. Research has established this fact. For example, in a laboratory test conducted some time ago with two groups of workers, one with good eyes and the other with poor eyes, the first group improved their efficiency 14 per cent when the lighting was raised from 3 to 12 foot-candles, and those with poor eyesight improved theirs by 22 per cent.

Continuous Rows of RLM Reflectors Equipped with Two 40-watt Mazda F White Lamps Provide 45 Foot-candles for Work Requiring Extremely Good Lighting

These laboratory findings have their counterpart in industry. For example, after the installation of a new lighting system, the Aetna Rubber Co., of Cleveland, found that whereas the greater amount of mistakes resulting in scrap occurred at night under the old lighting system, under the new, the spoilage of the day and night shift was about the same. Furthermore, the total spoilage decreased 30 per cent.

So much for employe effi-

ciency. Now let's see what good lighting will do to lessen employe fatigue. In our laboratory, people were tested one-half hour each week over the better part of a year on the simple task of reading a good book. Each week there would be a different amount of illumination from an indirect source. The three values selected were 1, 10, and 100 foot-candles. The subject kept the fingers of his left hand on a key which he was told to press every time he turned a page. That key was connected to another laboratory where the pressure unconsciously put on the key was reported, unknown to the person taking the test. The pressure on that key recorded nervous muscular tension. When reading under 100 foot-candles, the tension averaged only two-thirds as much as under 1 foot-candle, which is just another way of saying that the worker does not get so tired working under good illumination as when he works under poor illumination. It is an established fact that tired workmen are more susceptible to accidents and mistakes, which can prove quite costly in ruined work.

Proof of this is found in the case of the Lake Erie Steel & Blanking Co., of Cleveland. Says the president, M. S. Phillips: "When we installed an improved system of lighting, the most immediate result was a gratifying decrease in the number of accidents treated in the dispensary. Naturally, since our work is almost completely blanking and shearing of sheet steel, we run the risk of many cuts and deep scratches from the sharp edges of the steel. There was always the spectre of serious infection from these minor cuts. For this reason, we were pleased to note the appreciable decrease in the number of accidents, which we attribute to the fact that the men can now see with so much less effort that they avoid many accident hazards. In addition to this material advantage, we feel that the morale of the men has been noticeably improved, due to the decreased accident hazard and more cheerful working conditions."

To determine whether a lighting system is a help or a hindrance to efficient seeing and, hence, to efficient plant operation, the following points should be considered: Uniform lighting; absence of glare; the right amount of light; the right type of lamp; and the right type of lighting equipment.

The first requirement of an effective lighting system is uniformity. Uniform lighting provided from units located overhead not only eliminates shadows, but also enables every square foot of floor space to be utilized for work. Uniform lighting also aids seeing, for with extreme contrasts between bright and dim areas, the workers eyes are continually trying to adapt themselves to different brightness, and eyestrain is generally the result.

The location of outlets determines largely how uniformly the light will be distributed over an area, just as the location of sprinkler heads regulates water coverage in case of fire. To insure uniform lighting throughout the work area, it is desirable that the outlets be symmetrically spaced throughout the interior—that is they should be properly spaced in each bay.

Since most work surfaces are about 2 1/2 to 3 1/2 feet above the floor, for all practical purposes the spacing may be considered in relation to the mounting height of the lamps above the floor. Generally, a spacing in feet which is about the same as the mounting height results in reasonably uniform lighting.

Glare and Its Causes

It is not comfortable to look at the sun; neither is it comfortable to look at a sheet of water glistening in the bright sunshine. In looking at the sun, direct glare is encountered. In looking at the sheet of water in the bright sunshine, reflected glare is experienced. Both kinds may be present in the factory; the result is waste, not only of light, but also of time and materials, since glare interposes an obstacle to easy seeing. Worst of all, it raises the possibility of accidents, because where glare is present, seeing is subject to strain.

The principal causes of glare are (1) unshaded light sources; (2) lighting equipment which does not confine the light to the proper angle, but directs an excessive amount to the eyes; (3) lighting units equipped with lamps that are too large for them;

The Good General Lighting Provided in the Plant of the Lake Erie Steel & Blanking Co. has Reduced the Accident Hazard to a Marked Degree

(4) units with excessively high brightness at the angles reflected to the eye by shiny material; and (5) improper location or adjustment of lighting equipment, which permits bright reflections of the source to reach the eye.

The Right Amount of Light for the Job

The most desirable quantity of light for any particular installation depends primarily upon the work being done. The degree of accuracy, the fineness of the detail to be observed, the color and reflectivity of the work, will affect greatly the illumination which will produce excellent seeing conditions. Recommendations for various industrial activities are given in the bulletin "Recommended Practice of Industrial Lighting," which is published by the Illuminating Engineering Society, 51 Madison Ave., New York City, and may also be obtained from the local power companies. The following listing enables one to determine roughly the adequacy of the lighting required for difficult seeing tasks.

Group A — These seeing tasks involve the discrimination of very fine detail under conditions of extremely poor contrast for long periods of time. To meet these requirements, levels above 100 foot-candles are necessary. For such illumination, a combination of at least 20 foot-candles of general lighting plus supplementary local lighting is required.

Group B — This group of visual tasks involves the discrimination of fine detail under conditions of a fair degree of contrast for long periods of time. To provide suitable lighting for these conditions, illumination levels of 50 to 100 foot-candles are necessary. This requires a combination of 10 to 20 foot-candles of general lighting plus supplementary lighting.

Group C—The seeing tasks in this group involve the discrimination of moderately fine detail under conditions of better than average contrast for intermittent periods of time. The level of illumination required is 30 to 50 foot-candles, and in some instances, it may be provided from a general lighting system. Often, however, it will be found more economical, yet equally satisfactory, to provide from 10 to 20 foot-candles from the general system and the remainder from supplementary lighting.

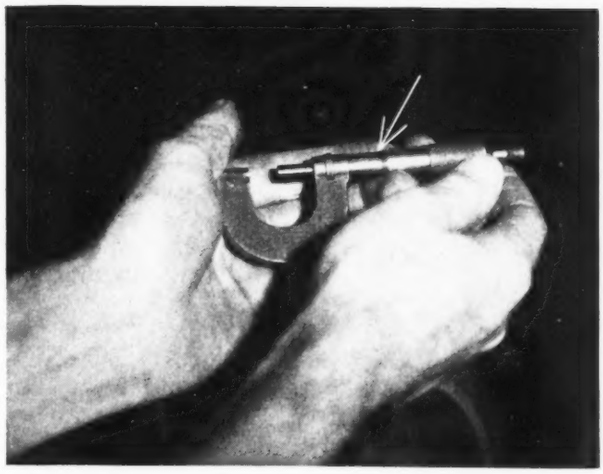
Importance of the Right Type of Equipment

The selection of the proper type of equipment is more important today than at any time in the history of illumination. In the early days of electric lighting, a reflector was largely a device for improving efficiency, because of the necessity of conserving light from the small low-wattage lamps then employed. Today's light sources, however, have outgrown the old type reflector, and we are now in an era of lighting advancement calling not only for intelligent selection of equipment for efficiency, but also for diffusion, direction, and control suited to the task.

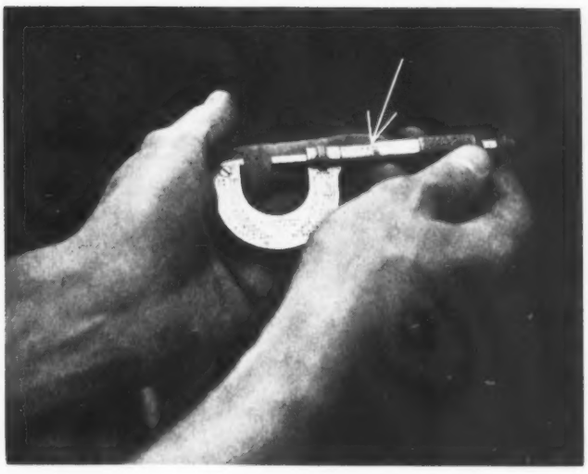
There are several fundamentals of performance that generally govern the choice of types of units, namely: (1) Desirable distribution of light and suitability for the particular interior involved. (2) Efficiency of light output. (3) Inherent maintenance of initial efficiency and ease of periodic cleaning and lamp replacement. (4) Adaptability to use of larger lamps should more light be required. (5) Sturdiness of construction. (6) Cost. The relative importance of each of these varies

A Large-area Low-brightness Light Source Provides the Kind of Lighting Required for Adequate Illumination of a Machine Tool

Glare May be Defined as Light out of Place. It Interferes with Proper Seeing, Reduces Efficiency, and Creates Accident Hazards



An Illumination of 100 Foot-candles is Provided on This Micrometer, and yet the Markings are Blurred because of Reflected Glare



Same Micrometer Lighted with 50 Foot-candles by a Large-area Low-brightness Source. Note the Distinct Markings

with different applications. For example, in a drafting-room, the elimination of bad shadows would be the first consideration, whereas in a foundry, the efficiency of producing illumination on the floor would be more important.

The illustrations on this page offer a pictorial example of what can happen when the wrong kind of equipment is used. Although only half as much light is provided on one micrometer as on the other, the markings on the barrel having the lower level of illumination are more clearly visible. This illustrates the fact that mere foot-candles do not necessarily produce a good lighting job. The quality of the lighting is more important. In choosing between two or more units, it is well to be governed by such considerations instead of first cost alone.

The newest general lighting equipment employing the filament lamp is the "Silvered Bowl Diffuser." This unit combines the efficiency and ease of maintenance of the RLM standard dome, widely used in industry, with the low brightness of the "Glas-steel Diffuser." The unit is designed for, and must be used with, a "Silvered Bowl" lamp. It is extremely comfortable to look at, particularly at the angles where direct glare is ordinarily most noticeable.

There are many new equipments available for use with fluorescent lamps. The most recent, for general lighting service, is the RLM unit employing two 40-watt fluorescent lamps. Used in continuous rows, this equipment provides the amount and quality of lighting required for many industrial operations.

The newest supplementary equipments are the projector lamp and the large-area low-brightness sources. The projector lamp combines within a single sealed unit all the elements necessary for the production of controlled light beams. It is made of a heat-resisting glass, which enables the lamp to withstand a wide range of temperature changes. This glass is also much stronger and heavier than that used in conventional Mazda lamps, and this lamp will, therefore, withstand considerable shock and abuse. It can be used wherever a high level of concentrated light is required.

The large-area diffusing units are of recent origin and consist of large luminous areas which are usually mounted 3 to 5 feet above the work surface and produce a quality of illumination similar to indirect lighting. They employ both filament and fluorescent lamps, and are recommended for operations involving detail upon polished surfaces.

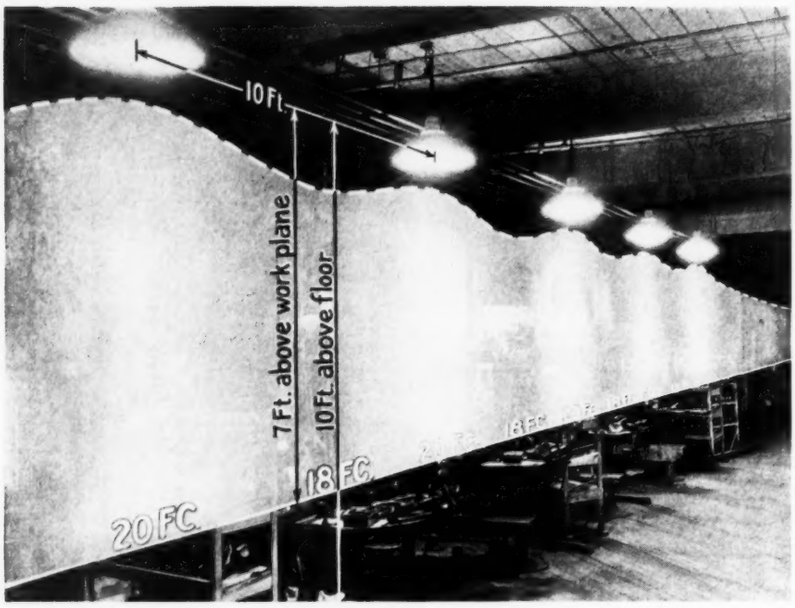
Selecting the Right Lamp for the Job

There are three different types of lamps applicable for industrial use—filament, fluorescent, and mercury. Requirements in any given case dictate which type will be most satisfactory.

Filament Lamps—These lamps, available with clear or inside-frosted bulb, and with the bowl white or silvered, fulfill the majority of lamp requirements for factories.

Fluorescent Lamps — Mazda F (fluorescent) lamps have a number of characteristics not possessed by filament lamps, and hence, are finding wide use as industrial illuminants. These lamps possess the following advantages: (1) Produce light of daylight quality; actually the light from the daylight fluorescent lamp is the closest approach to natural daylight that it has ever been possible to produce by an artificial illuminant at high efficiency. (2) Permit higher levels of lighting with existing wiring, provided power factor equipment is used at the lamp. (3) Produce cooler illumination; the radiant heat from fluorescent lamps is only one-quarter that of filament lamps for equal foot-candles; consequently the fluorescent lamp can furnish one hundred and more foot-candles without the discomfort from heat formerly associated with high foot-candles.

The Mazda F lamps are of the electric discharge type, employing mercury vapor as the medium for maintaining the arc. The lamps convert invisible ultraviolet energy, produced by the arc, into visible



For Best Seeing Conditions, the Illumination throughout the Work Area should be Reasonably Uniform, which Results from Properly Spaced Light Units

light through the medium of fluorescent powders with which the inner surface of the bulb is coated. Since the lamps are essentially arc lamps, they require some type of ballast equipment. Such equipment is available today for operating a single lamp or two lamps. With it, the power factor is corrected to better than 90 per cent, thus assuring maximum utilization of the wiring.

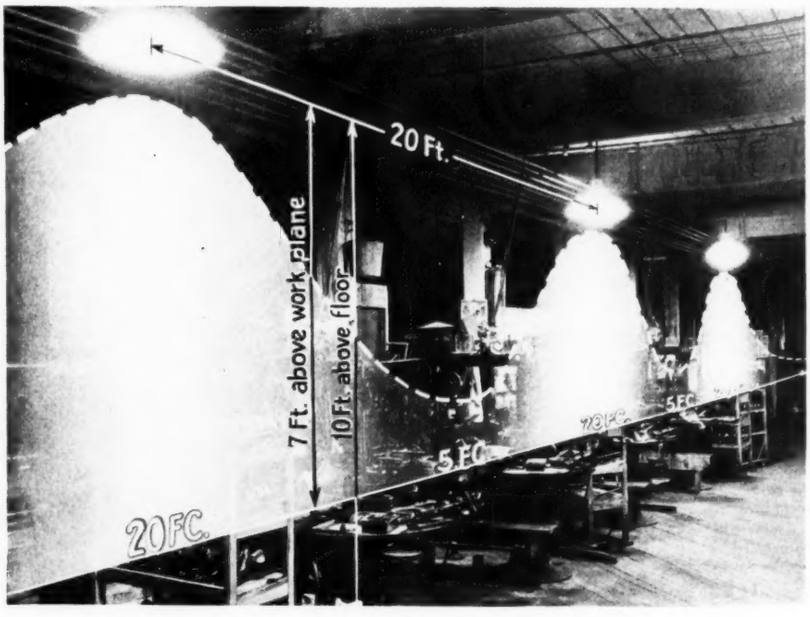
Before the introduction of the 40-watt 48-inch, the 85-watt 58-inch, and the 100-watt 60-inch lamps, fluorescent lighting was employed primarily for supplementary installations. Since the development of these new sources, however, fluorescent lamps are being used more and more for general lighting. Although available in eight colors, only the daylight white and bluish-white lamps are used for factory lighting. Personal preference will determine which is used where color quality is not a factor.

Mercury Lamps—These lamps are available in 250- and 400-watt sizes for general lighting purposes. The mercury lamps differ radically in principle from filament lamps, both in their operation and in the color quality of the light produced, but are applicable to a wide range of industrial installations. They also represent a departure from former electric discharge sources in that they are provided with conventional screw bases and are adaptable to common types of reflecting equipment.

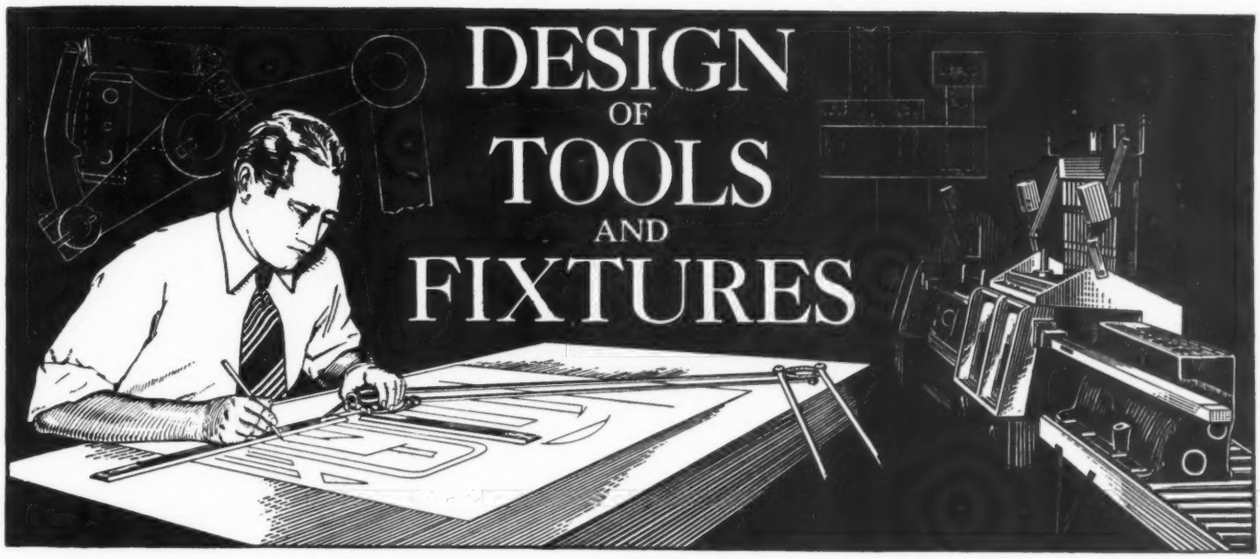
When mercury lamps are employed, they are commonly installed (1) as mercury lighting alone; (2) combined with filament lamps in the same unit (usually the same wattage of filament as of mercury); and (3) on alternate outlets with filament lamps.

From the standpoint of efficiency, the alternate, staggered combination installation is recommended. As the name implies, mercury and filament lamps are placed in alternate outlets. This is especially applicable to high-bay installations where it is desirable to obtain maximum control and efficiency. It is recommended that the spacing between the units be not more than 0.8 the maximum permissible spacing of a filament system. This provides good light mixture from the two systems, resulting in illumination approximating that of daylight in color value. This type of system is usually not recommended for mounting heights less than 13 feet, principally because of the accentuation of color shadows.

With the Defense Program calling for more and more production, plant facilities are being forced to capacity in many industries. Whether this demand for goods is met through expansion or modernization, improved lighting can help in meeting the production problems.



When the Light Units are Spaced too Far Apart, the Intensity of the Light will Vary, as Indicated by This Diagram



Welding Fixture for Small Production Job

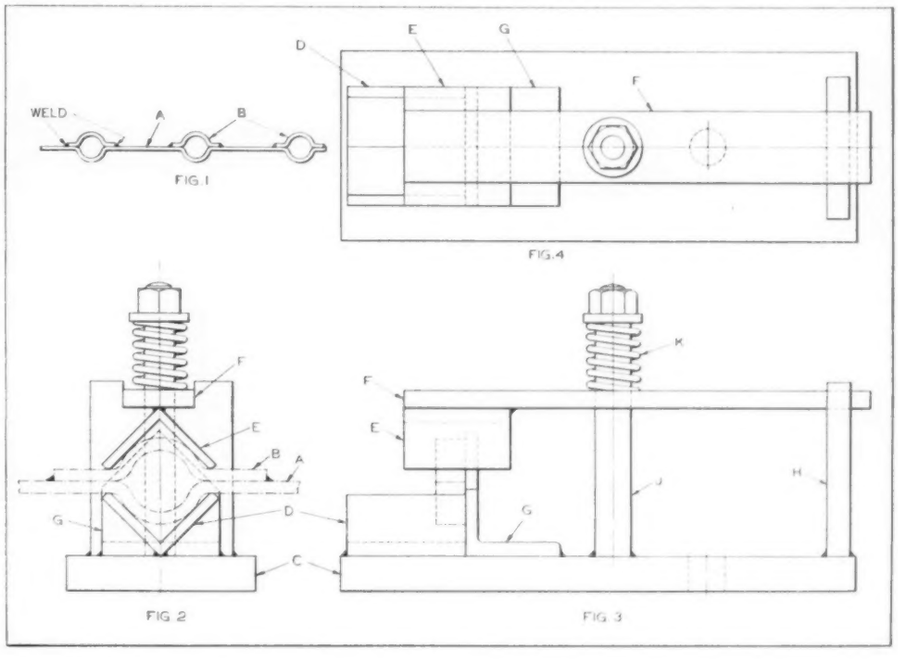
By JOSEPH WAITKUS, Wellsville, N. Y.

The fixture shown in the accompanying illustration was developed for a small-production welding job, and was constructed at low cost. The bar *A*, Fig. 1, is provided with a series of depressions spaced at definite intervals. At each depression, a formed bar *B* is welded to bar *A*, thereby completing a series of eyes along the length of the bar assembly. The spacing of the eyes varies, and the bars produced in different lots may not have the same number of eyes. To meet these conditions, a separate fixture for each eye assembly is employed. The separate fixtures can be adjusted to give any spacing required, as well as to suit any number of eyes in the length of the bar assembly.

The design of the fixture developed for the welding operations is shown in the enlarged-scale views Figs. 2 and 3. A positioning angle-member *D* is welded to the base *C*. Directly above angle-member *D* is another angle-member *E*, which is welded to a floating bar *F*. An angle-member *G*, fastened to the base *C*, serves as a back-stop, and assists in lining up the two parts that form the eye.

To allow free movement for the upper positioning angle-member *E* and to retain it in the proper position over the lower angle-member *D*, the end of bar *F* is located in a slot in bar *H*, fastened to the base *C*. A rod *J*, welded to base *C*, also serves as a guide for bar *F*. A spring *K* furnishes the necessary pressure for keeping the members being welded in their proper positions.

Several fixtures of the design shown were fabricated and bolted to the table, the space between the fixtures conforming to the spacing desired between the eyes in the bar assembly. With this equipment, it is simply a matter of sliding the bar *A* on the lower positioning member *D* and inserting a formed bar *B* under the angle-member *E*. The entire operation takes only a fraction of a minute, and the welding operation is easily performed, making it possible to obtain a high production rate.



Figs. 2, 3, and 4. Welding Fixture Unit Designed for Use in Welding Pieces B, Fig. 1, to Member A

Drill Press with Built-In Universal Jig

By JOSEPH I. KARASH, Tool Design Department
Reliance Electric & Engineering Co., Cleveland, Ohio

A typical end bracket for a motor is shown at *B*, Fig. 2. Brackets of this kind were formerly drilled on a radial drill press by mounting them on a table, which was indexed into position for drilling each of the four holes *H*, one at a time, a single bushing in a fixed position being used to guide the drill. Eventually the shop lots increased in size to a point that justified the use of multiple drilling equipment. This brought up for consideration the tooling problem for an entire line of parts. It was found that none of the equipment previously used on the drill press could be adapted for multiple drilling operations.

A study of the complete line of parts indicated that the following points were of prime importance in designing the proposed multiple drilling equipment: Speed of operation; handling of work; handling of jig; chip disposal; and initial tool cost. As most of the brackets were too heavy to be lifted by hand, it was desirable to use the front of the drilling machine table as a loading platform, on which the brackets could be placed with a crane. Since it would be difficult to lift a bracket while located under the drill head, it was obvious that a type of jig should be used that would allow the bracket to be slid in and out of the drilling position without requiring it to be lifted manually. It was considered desirable to design a jig that could be secured to the drilling machine table. This would facilitate maintaining accurate alignment between the bushings and the drills, and would eliminate all handling of the jig, which, with the added weight of the work, presented a problem.

Fig. 1. Built-in Jig Used with Multiple Drilling Head

By using a type of jig that has its locating surfaces above the work, chips produced by the drilling operation would fall free, thus eliminating any necessity for cleaning the jig between operations. The set-up that was found to meet our requirements satisfactorily is shown in Figs. 1 and 2. In addition to the jig, a lifting device was built into the drilling machine, as shown in Fig. 2.

A hole was bored through the drilling machine table to admit the cold-rolled steel plug *A*. A heavy-duty automobile jack *C* of the worm and double-gear type was mounted on the sub-base. The steel plug *A* was attached to the lifting member or ram of the jack, as indicated. A handwheel *D* and connecting bar were provided, so that the jack could be operated from the front of the table. In the down position of the jack, the end of the steel plug *A* is flush with the surface of the table.

The drill jig itself is simply a piece of

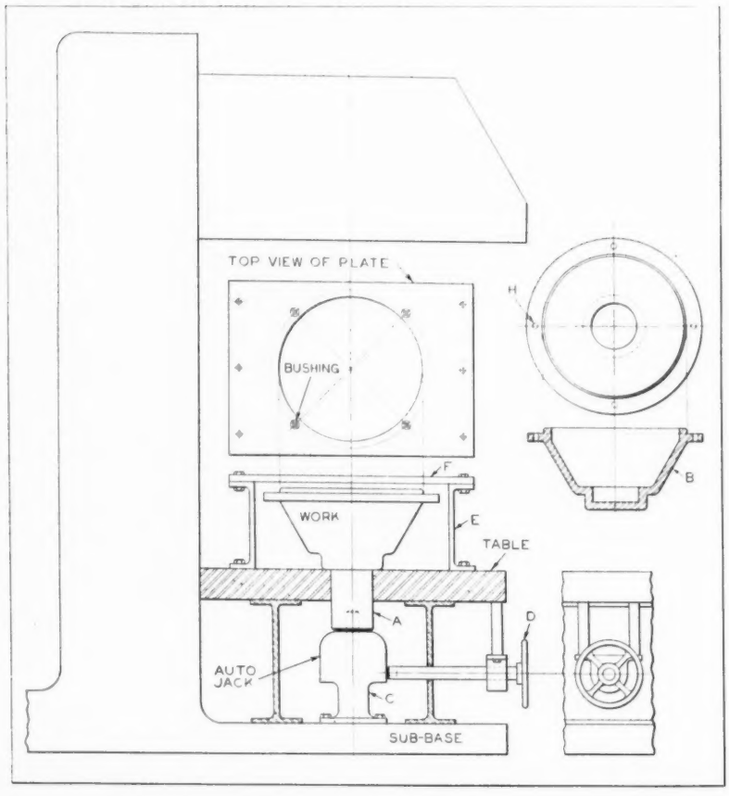


Fig. 2. Diagram Showing Arrangement of Drill Press with Built-in Universal Jig, in which Automobile Jack is Used for Clamping Work

boiler plate *F*, machined and provided with drill bushings to suit the work. The bushing plate is supported on channel-iron pieces *E*, and can be used for work that varies in height as much as 3 to 15 inches by simply substituting channels of the required height.

The work is placed on the end of the drilling table with a crane, and slid on the table until it is in the position shown in Fig. 1. The work is then raised and clamped against the bushing plate *F* by spinning the handwheel *D* that operates the jack. Since the top plate is bored out to fit the work, the operator has a clear view which permits him to align the work with the opening as it is raised into contact with the bushing plate. When the drilling operation has been completed, the work is lowered and slid out of the jig.

The use of an automobile jack in a machine tool as described is rather unusual. The actual cost of the heavy-duty jack was only $5, yet it served its purpose as well as the rack and pinion lifting devices usually constructed for such work at much greater cost.

Simple Quick-Acting Device for Closing Lock-Seams

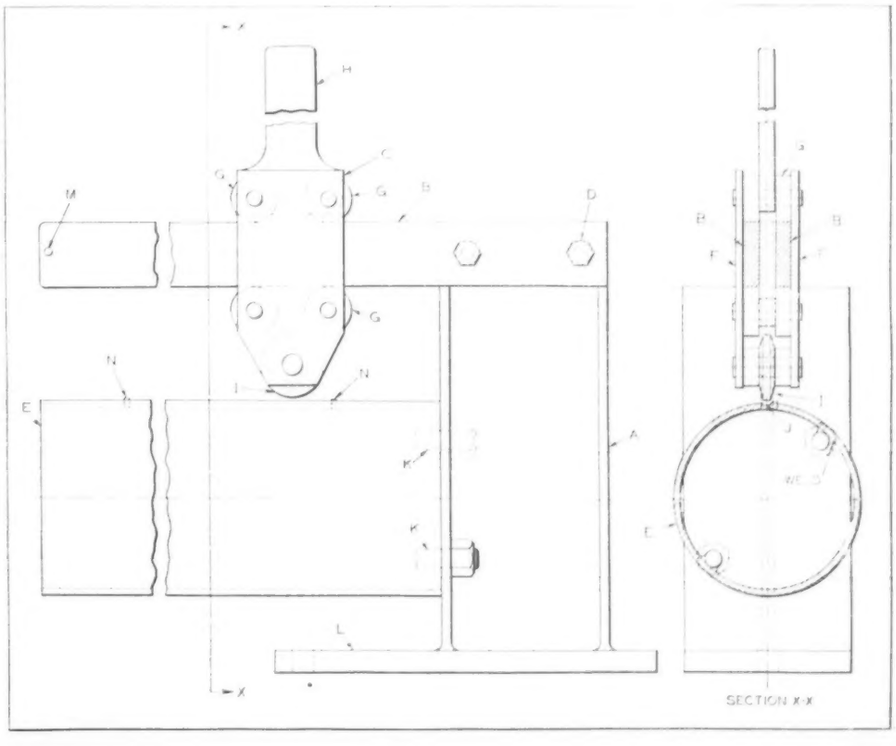
By GEORGE WILSON, Mankato, Minn.

The device here illustrated was developed for closing lock-seams in thin metal cylinders that form the bodies of flour sifters. It is of especial interest because the usual operating crank has been eliminated, a direct pull of the handle *H* serving to close the seam formed in the metal, which is only 0.012 inch thick. With this arrangement, a quick forward pull and a backward push of the traveling head makes a good job of closing the seam and enables the work to be handled much faster than with the conventional crank-operated seamer.

The upright member *A* is made from a piece of 4- by 4-inch T-rail. The upper end of this piece has its flange cut away, leaving a projecting web to which the guide bars *B* for the traveling head are bolted. The guide bars are made of 3/8- by 1 1/2-inch material, and are held in place by bolts *D*. The bolts are made a close fit in the bars and web to prevent the bars and work-horn *E* from spreading apart. The head *C* consists of side plates *F* carrying rollers *G* that run on the guide bars. Pressure roller *I* can be made with a hub that centers it between the side plates, or spacers can be used in place of the hub.

Handle *H* is carried on the bearing pins of the upper rollers *G*, and serves as a spacer for the two upper rollers. Shims are used on the sides of the web of the upright to obtain the proper spacing of the bars. The work-supporting horn *E* consists of a piece of well-casing, but other pipe material can be used. This casing or pipe is turned on the outside to a loose fit inside the work. The groove *J* in the horn is made a little wider than the width of the lock-seam in the work, and is just deep enough to bring the outside of the seam flush with the outer surface of the work when the seam is pressed tightly together.

The horn is held securely against upright *A* by means of studs *K*, welded to the inner surface. These studs pass through holes in the upright. The nuts on the outer ends of the studs *K* can be loosened to permit vertical adjustment of the horn to obtain proper spacing between the horn and roller *I*. The base *L* for attaching the device to the bench is made from a piece of 3/8-inch steel, and is welded to upright *A*. The pin *M* prevents the head from being pulled off the guide bars. Short pins *N*, which enter grooves rolled around the work, serve to locate the seam in line with the slot in the horn. Pins *N* could not, of course, be used for work having no rolled grooves.



Simplified Quick-acting Lock-seam Closing Device Developed for Closing the Seams in Thin Metal Cylinders

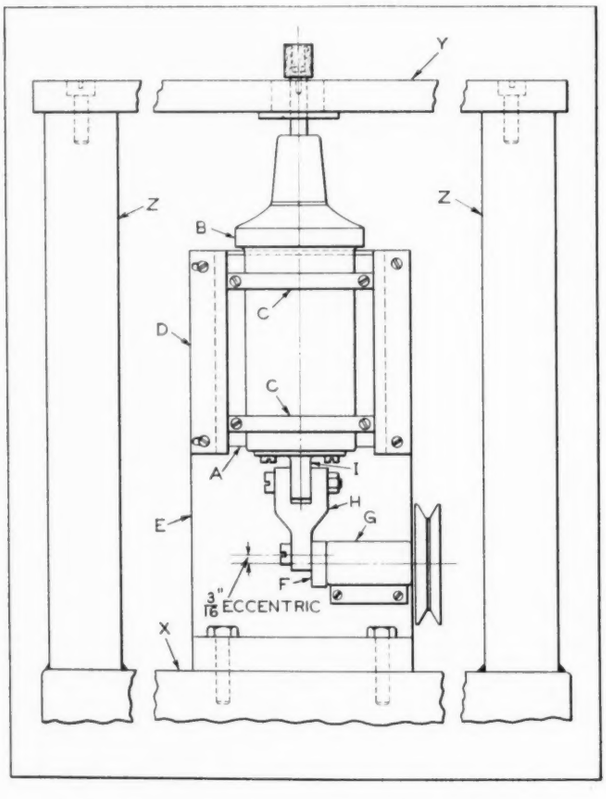
Home-Made Contour Grinder

By ARMEN TASHJIAN, Springfield, Mass.

Were it not for the vertical movement required of the grinding spindle of a contour grinding machine, equipment of this kind would consist merely of a surface plate and a hand grinder mounted with the spindle at right angles to the surface plate. The home-made contour grinder here illustrated was built from scrap materials, and although not the equivalent of a standard commercial machine, it nevertheless met the requirements of a certain shop.

The sub-base *X* is made from an old discarded machine. The 18- by 18- by 3/4-inch plate *Y* was resurfaced and drilled and counterbored at the four corners. Four two-inch square posts *Z* were cut to identical lengths, tapped at one end, and attached to plate *Y*. The assembly was then welded to base *X*, making a very rigid framework.

The grinder unit is of simple construction, as shown in the illustration. Slide *A* holds the light die grinder *B* by means of straps *C*. Beveled slide *A*, together with bars *D*, which are also beveled, complete the dovetail slide assembly mounted on angle-plate *E*. The grinder and the grinding wheel are reciprocated vertically through a stroke of 3/8 inch at the rate of one hundred strokes per minute by means of the crankshaft *F*, mounted in housing *G*. The connecting-rod *H* is attached to the end of grinder *B* by bracket *I*. The bar *D* at the left has elongated holes in it which permit making adjustments to compensate for wear on slide *A*. Parts *G*, *H*, and *I* are fitted with bronze bearings.



Reciprocating-stroke Contour Grinder Built in Shop

Power for driving the crankshaft which imparts the vertical motion to the grinder is derived from a low-speed 1/4-H.P. motor located at the rear of the angle-plate assembly. A 1-to-4 ratio V-type drive gives the required one hundred strokes per minute.

Ordinarily, a cup-wheel 3/4 by 1 inch in size is used, although the 1 1/16-inch bored hole in plate *Y* permits a 1- by 1 1/2-inch wheel to be employed. The bottom of the grinding wheel, when in use, is located at least 1/16 inch above the top of the surface plate at the end of the upward stroke of the grinding wheel.

While the grinding wheel is usually dressed "free-hand," a dressing fixture can be provided consisting simply of a small angle-piece carrying an adjusting screw with a truing diamond mounted on its outer end. A simple fixture of this kind can be attached to the table and the diamond advanced until it lightly touches the grinding wheel. The eccentric rod *H* is then disconnected from part *I* and the grinder traversed vertically with the right hand while the left hand carefully feeds in the diamond.

* * *

Large-Scale Industrial Training Program

More than 500 young high-school graduates are now receiving training to become skilled mechanics and machine operators under an expanding trade education program conducted by the Westinghouse Electric & Mfg. Co. The number of young men normally enrolled in the company's four- and two-year training courses will be more than doubled. Most of the training will be conducted at the Westinghouse East Pittsburgh works, where 250 young men are normally enrolled in the four- and two-year training courses. The expanded program, however, also affects the Philadelphia, Pa., the East Springfield, Mass., and the Baltimore, Md., works, each of which have been adding to their quota of young men enrolled in the training courses.

* * *

Machine Tool Exhibit at the Chicago Museum of Science and Industry

An exhibit of machine tools at the Museum of Science and Industry in Jackson Park, Chicago, Ill., has been opened to the public. This exhibit is sponsored by the National Machine Tool Builders Association, and has been made possible by a contribution from the Association and also by contributions from a number of the members in the form of equipment and material. The exhibit is open from 10 A.M. to 4 P.M. on week days, and from 10 A.M. to 6 P.M. on Saturdays and Sundays.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

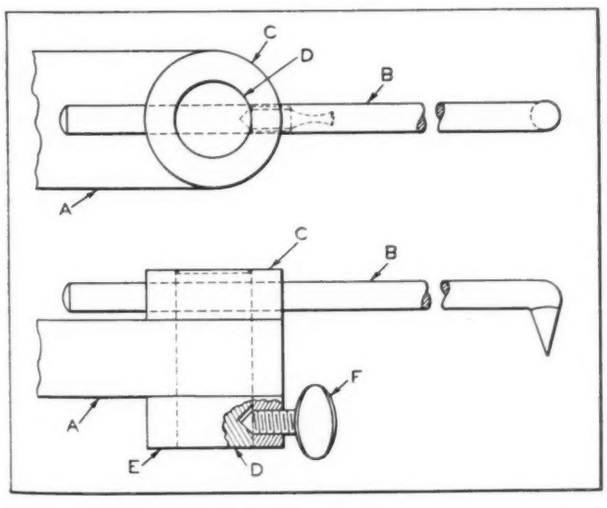
Simple Three-Way Adjustment for Indicator

A gage or indicator that could be adjusted in three directions and locked firmly in place with a single clamping screw was required for a wire-working machine. The simple device designed to meet these requirements is shown in the accompanying illustration. Bracket *A*, which is stationary on the machine, is bored to receive shaft *D*, which is drilled at the upper end to accommodate indicator bar *B*. Collar *C* is bored to fit loosely on the upper end of shaft *D* and has a hole drilled through it that registers with the hole in shaft *D*. This permits indicator bar *B* to be passed through the holes in both collar *C* and shaft *D*.

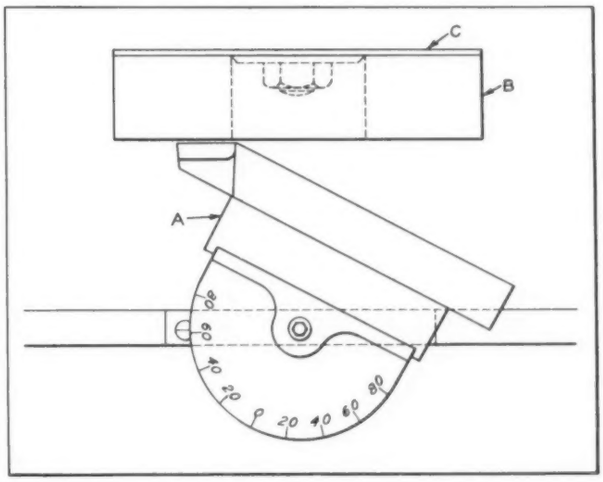
Collar *E* is bored to fit loosely on the lower end of shaft *D*, and carries pointed thumb-screw *F*. Shaft *D* is spotted at its lower end, the spot being located slightly out of register with thumb-screw *F*. With this arrangement, indicator bar *B* can be revolved on its axis; it can also be revolved around the axis of shaft *D*, and the length of the working end can also be adjusted.

Turning thumb-screw *F* causes its point to enter the spot in shaft *D* and thus draw the latter member downward, locking bar *B* in place through the clamping action between shaft *D* and collar *C*. The clamping action obtained by this arrangement also serves to lock the entire assembly through the pressure applied on bracket *A* by collars *C* and *E*.

Philadelphia, Pa. L. KASPER



Holder that Permits Three-way Adjustment of Indicator Bar B



Protractor Fitted with Notched Block A to Facilitate Grinding Cemented-carbide Tools

Protractor Fixture for Use in Grinding Cemented-Carbide Tools

The simple block shown at *A* in the accompanying illustration will facilitate grinding cemented-carbide tools to an angle on special carbide tool grinders. When grinding a tool to an angle that is nearly parallel with the shank, the protractor regularly furnished with such machines does not bring the tool as close to the wheel as is necessary for proper grinding. The block *A*, notched to fit against the protractor face, will overcome this difficulty. Block *A* is about 1 inch square.

The cylinder type wheel *B* is cemented to steel back-plate *C*, a nut and washer being used to secure the wheel to the machine spindle. A considerable saving in wheel cost can be effected by using the cylinder type wheel having a steel back-plate instead of the cup type wheel. For grinding cemented-carbide tools like the one illustrated, the cylinder type wheel can be used until it is worn down to the steel back-plate.

Chicopee Falls, Mass. STANLEY M. WHITE

* * *

Permanently higher wages can be paid only if more goods are produced and consumed by a constantly larger number of people; and this increased production, in turn, can be obtained only by greater manufacturing efficiency. The three factors—better machinery, greater production and higher wages—are inseparable.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Drawing Steel Cup with Sharp Inside Corner

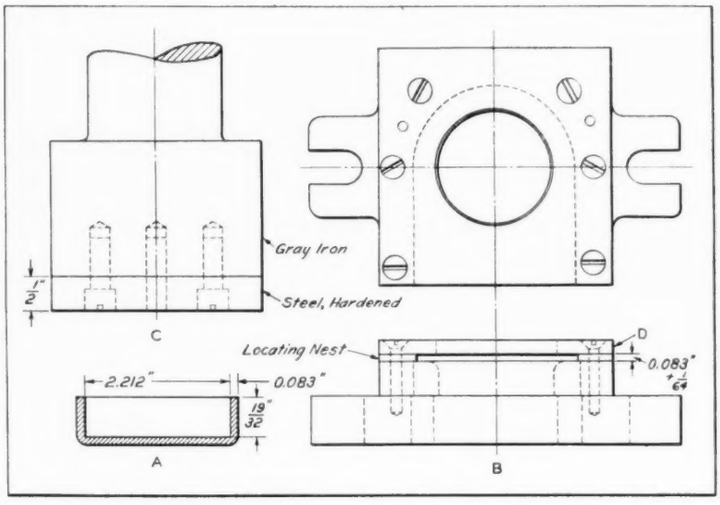
L. S.—We are confronted with the problem of drawing a cup from soft steel, about 5/64 inch thick, with a sharp inside corner and an even edge, using a single-acting press. The outside diameter of the cup is about 2 1/2 inches, and the depth 5/8 inch. The cost of the die must be kept as low as possible, owing to the fact that the number of pieces required may be comparatively small. The question is whether the cup can be drawn with a single push-through die or whether a die of more elaborate design must be employed, using a blank-holder or pressure ring? If the simple push-through type of die is made up and fails, the work performed on it will be lost. Some cut-and-try work will, of course, be necessary to determine the exact size of the blank required. Will someone who has had experience in handling problems of this kind describe the die and methods employed?

Answered by George Wilson, Mankato, Minn.

For work of this kind, it is best to make the drawing die first and try pushing through blanks of different diameters until the correct size is found. If the blank is formed into a cup of uneven edge, some form of hold-down must be added. This was provided for in producing the cup shown at *A* in the illustration by designing the die as shown at *B*. With stock as heavy as that used for the cup shown, it is not necessary to use a spring pressure pad, a stiff plate *D* similar to a stripper being used to keep the disk from turning up around the edges as it is forced into the die, or to make the stock bend over the edge of the die and iron out the wrinkles. This form of construction costs considerably less than one using a hardened ring and spring.

A radius of 1/8 inch was first tried on the corner of the die to keep the edge of the cup as even as possible. This radius, however, gave too much stretch to the metal near the closed end of the cup on the outside, leaving an unsightly mark or ring. With the radius increased to 5/32 inch, the stretching action was reduced sufficiently to make the appearance of the drawn cup passable and to give a practically even edge.

When the hold-down plate *D* was removed for an experimental run, the edge of the cup produced was considerably scalloped, showing that merely pushing the blank through the die will not work with this depth of cup, when only one drawing operation is performed. With a 3 1/2-inch blank and deeper cups, the edges were slightly uneven. It required a blank 3 3/16 inches in diameter with stock of the thickness indicated to produce the cup.



Die for Drawing Steel Cup A in One Stroke of Press

Cast Iron for Air-Cooled Cylinders

E. K.—What composition of cast iron is recommended for light, air-cooled, internal-combustion engine cylinders?

Answered by Editor, "Nickel Cast Iron News," International Nickel Co., Inc., New York City

In answering this question, the experience of the LeRoi Co., Milwaukee, Wis., is of value. This company builds a four-cylinder, four-cycle, short-stroke engine which is unusually compact and light in weight, yet is built to stand up under continuous, heavy-duty operation. The cylinder and cylinder-head castings are produced from "Mocasco 30" iron, a product of the Motor Castings Co., Milwaukee. This iron has the following composition: Total carbon, 3.30 per cent; silicon, 2.25 per cent; manganese, 0.85 per cent; nickel, 1.15 per cent; and chromium, 0.15 per cent. The Brinell hardness is 207 to 228. The iron is readily machinable.

General Electric Co. Develops New Polyphase Motor

A NEW line of polyphase induction motors in integral horsepower sizes, known as "Tri-Clad," has been developed by the General Electric Co., Schenectady, N. Y., as the result of a broad survey of the changing requirements of motor users. A streamlined appearance, more complete mechanical protection, better insulation of current-carrying parts, improved bearing design and lubricating arrangement, and more efficient cooling are improvements claimed for these motors.

In place of the conventional open frame, the motors have a cast-iron frame of the box type with end shields enclosed above the center line to reduce the possibility of liquids, chips, or other foreign matter entering the motor and also to provide protection against heavy blows or rough usage. Large, integrally cast rotor fans draw air through openings in the lower portion of each end shield. Cooling efficiency is also increased through the use of large, smooth air passageways and baffles which control the air direction, velocity, and discharge through openings just above the motor feet. These motors operate well within the standard temperature rise limit of 40 degrees C.

Formex, the new, tough, heat- and solvent-resisting magnet wire is used on all motors of this new line. Further protection for the motor coils is provided by an application of an improved synthetic-resin varnish and a covering coat of Glyptal red. The resulting tough, space-saving motor insulation is highly resistant to heat, moisture, acids, oils, and mechanical abuse.

Fig. 1. "Tri-Clad" Polyphase Motor of New Line Brought out by General Electric Co.

By using newly designed sleeve bearings with the proper proportion of length to diameter, the deflections produced in the shaft inside the bearing do not exceed the thickness of the oil film. The spiral type grooving developed for the new sleeve is designed to assure thorough oil distribution.

A new and wider conduit box with unusually large working space simplifies installation in close quarters. The box, whether of the pressed-steel or watertight type, can be mounted in any one of four positions. The stator is reversible, allowing the conduit box to be located on either side of the side-wall mounting.

Motors equipped with ball bearings can be operated vertically or mounted on a side wall. The end shields can be easily changed to any one of four positions. The oil-filler gage can also be located on either side of the motor. The same assembly of shaft and rotor is used on many popular sizes of both sleeve- and ball-bearing motors. Thus many sleeve-bearing motors can be converted to ball-bearing motors by merely changing the end shields, bearings, and caps. Likewise ball-bearing motors can be converted to the sleeve-bearing type if precautions are taken to prevent damaging the journals when removing the ball bearings.

Fig. 2. Final Checking Operations on G-E "Tri-Clad" Motors as They Come from the Production Line

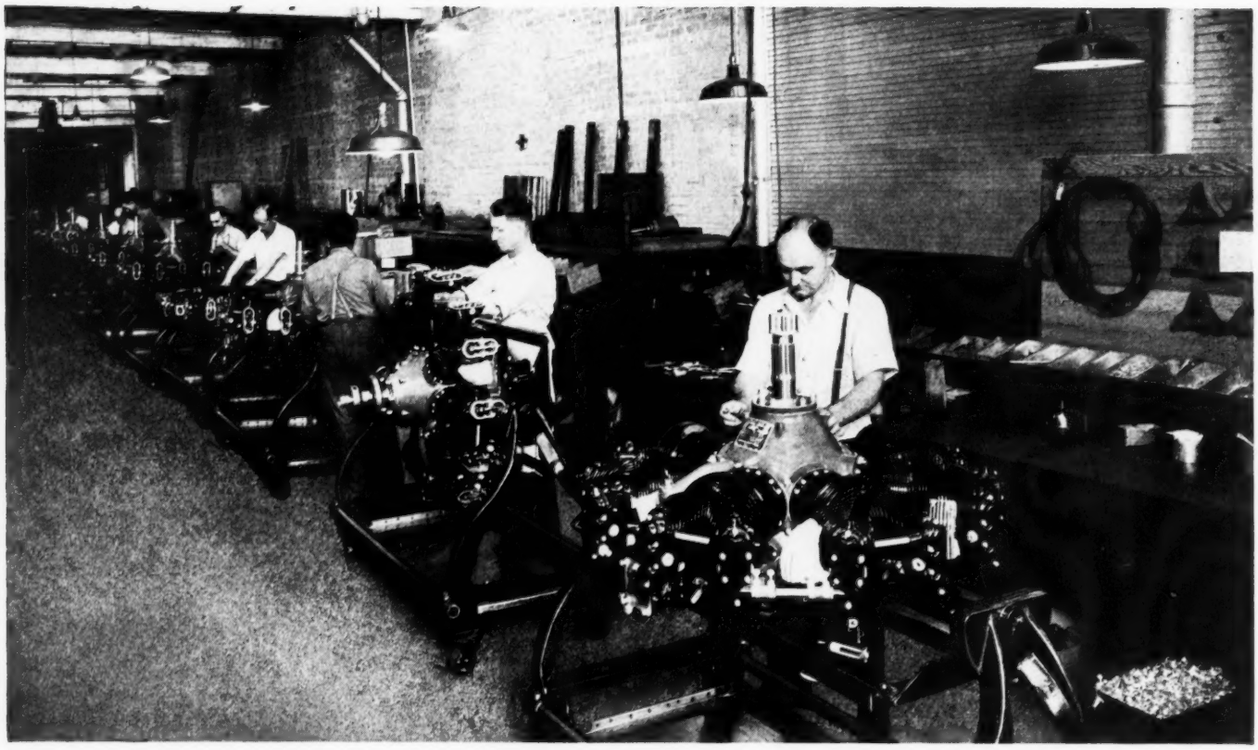


Fig. 1. General View of an Assembly Line at the Continental Motors Corporation which Turns out Gasoline-driven Radial Air-cooled Engines for the Operation of Army Tanks

Producing Radial Gasoline Engines for Driving Army Tanks

By CHARLES O. HERB

HUNDREDS of radial air-cooled gasoline engines have already been supplied by the Continental Motors Corporation, Muskegon, Mich., for installation in the medium size tanks built at Rock Island Arsenal and at the American Car and Foundry Company, Berwick, Pa. The Continental tank engines are similar to those built by the concern for training airplanes of the Army Air Corps and the United States Navy, except for a special fan, cowling, and baffles which are necessary for cooling. The fan draws the cooling air into the tank compartment from overhead, and the cowl and baffles direct it toward the various sections of the engine that would otherwise tend to become overheated.

These tank engines are of the seven-cylinder single-row type, and are guaranteed to have a rating of at least 250 B.H.P. when operated at 2400 R.P.M. They have a bore of 5.125 inches and a stroke of 4.625 inches.

Before these engines are released to the Government, they undergo the same stringent tests as are given to aircraft engines. The tests are conducted in a building located several miles outside of Muskegon, to which the engines are transported after being completely assembled in the main plant. In the test plant, the engines are run-in for a prescribed number of hours on a torque stand at various speeds from 600 R.P.M. to the full throttle speed of at least 2400 R.P.M. While being run, the engine is checked for horsepower output at the various speeds, gasoline and oil consumption, proper timing, magneto performance, leakage, etc.

The engine is now disassembled and every part thoroughly examined to detect any wear, leaky valves, or other signs of unsatisfactory performance. It is then once more reassembled, and the fan, cowl, and baffles put on for the first time. Next, the engine is taken to a water brake dynamometer for a final test, during which the horsepower output or torque load is again determined at various speeds from 600 to 2400 R.P.M., and a

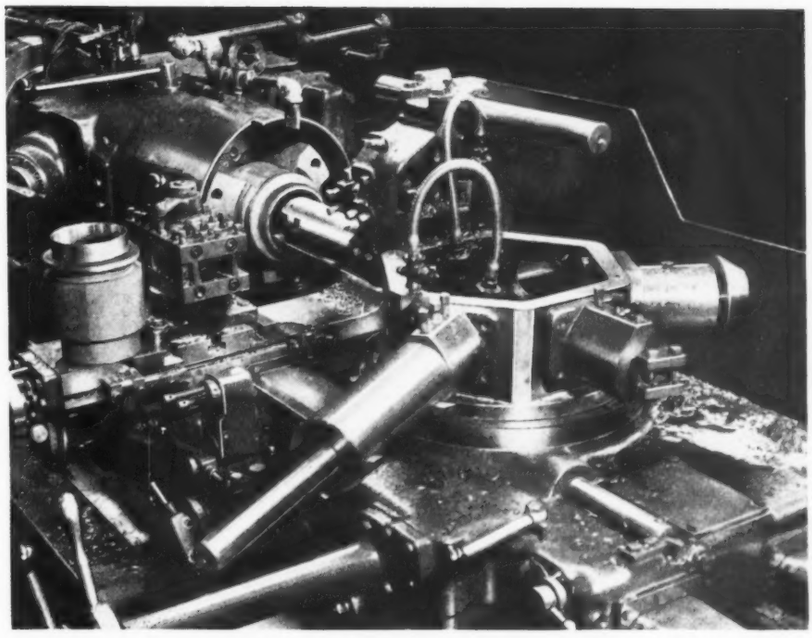


Fig. 2. Turret Lathe Employed for Facing, Turning, and Boring Operations on Cylinder Barrels for Tank Engines

corresponding curve is developed on a paper, which is later notarized and from which blueprints are made and supplied with the engine to the War Department. In this way, the War Department can file sworn statements as to the test-room performance of each engine that it receives.

During this test on the water brake stand, the lubricating oil coming out of the engine must be of a certain temperature, within prescribed limits, and the oil pressure must be within the maximum and minimum ranges, which vary only five points. Oil consumption is again checked during the operation of the engine at full speed for an entire hour. These performance records are also added on the paper showing the horsepower curve that is supplied to the War Department.

If the engine passes this test satisfactorily, a governor is mounted on it to insure operation in service at speeds no higher than 2400 R.P.M., and it is then crated for shipment to the War Department. Should an engine fail to pass the test, it would again be disassembled to correct the fault and retested all over. In making the water brake test, readings of the temperature and humidity in the test room are taken and corresponding calibrations made, because the engine performance is different when the air is heavy than when it is light.

Since the parts that make up these tank engines (with the exception of the fan, cowling, and baffles) are the same as those employed in the construction of the same type of airplane engines, they are produced on the same machine tools and put together on the regular radial engine assembly line. Typical operations on these parts will be described in the following.

One of the newest machines in the shop is the Jones & Lamson turret lathe shown in Fig. 2, which performs the first operation on the cylinder barrel. During the first step in the operation, the front of the flange is rough-faced by a tool at the back of the cross-slide. Then two tools at the front of the cross-slide turn the hub and the flange rim. At the same time, tools mounted on a bar extending from one of the turret faces rough-bore the barrel, under-cut for a chamfer at the front end of the barrel, and face the hub to length.

The turret is then indexed to bring a second boring-bar into line with the work, after which it is advanced for finish-boring the barrel and turning the chamfer. While these cuts are in progress, two cutters on the square turret, the latter having also been indexed, finish-turn the hub and the flange. Limits of plus or minus 0.001 inch must be maintained in turning the hub and plus or minus

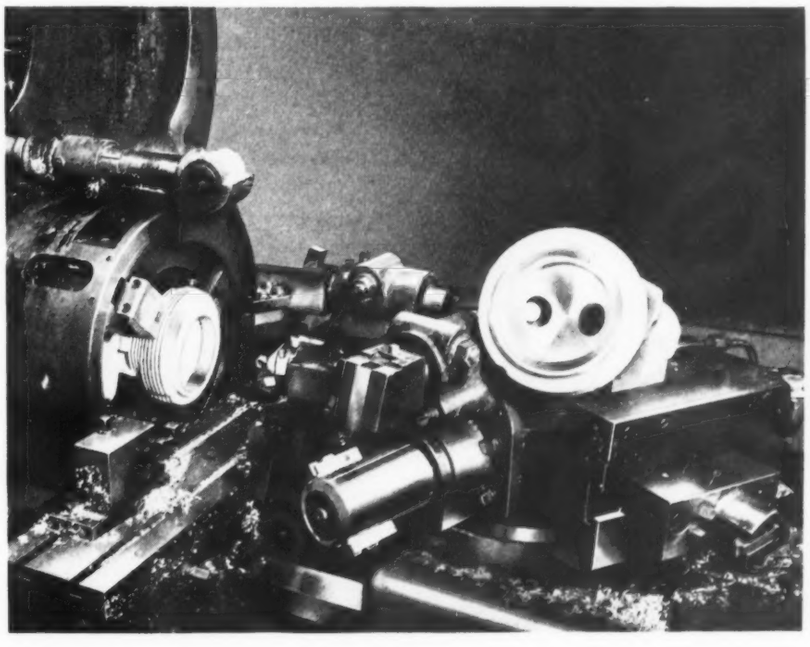


Fig. 3. Automatic Used for Machining the Combustion Chamber and Other Surfaces on Cylinder-head Castings

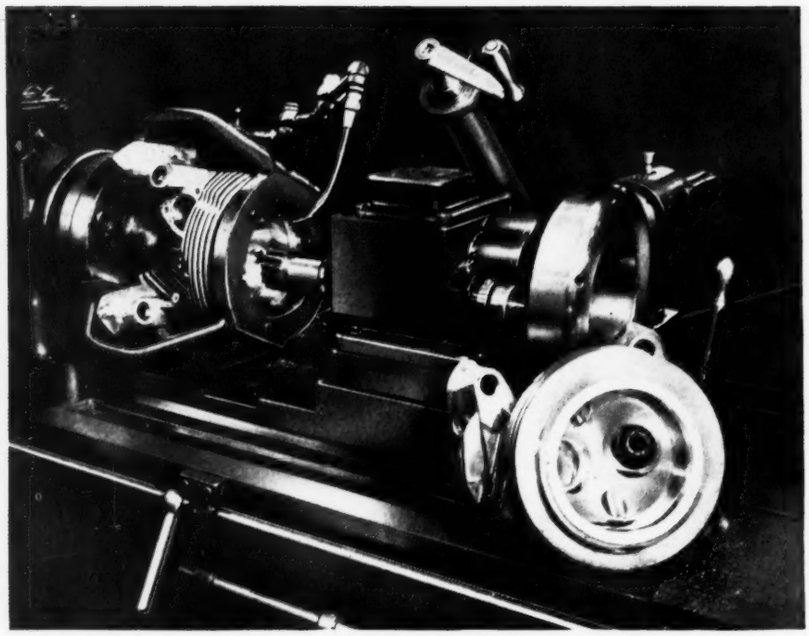


Fig. 4. Milling Internal Threads on Cylinder Heads to Mate External Threads on Cylinder Barrel, on which They are Later Shrunk

0.002 inch in machining the bore. The nominal diameter of the bore is 5 1/8 inches, and the length 8 1/2 inches. Carboloy-tipped tools are used in this operation for a number of the cuts.

A Potter & Johnston automatic used for machining the cylinder head is shown in Fig. 3. The work is held by means of a three-jaw air-operated chuck. Tools on the first face of the turret rough-bore the thread and shrink fits, and rough-turn the outside diameter at one end. A tool on the second turret face then rough-machines the spherical inside of the combustion chamber. During this cut, the tool is fed through the required arc by an arm at the back of the cross-slide which advances against a plunger on the head carrying the spherical surface turning tool. Steady support is afforded to this tool by the engagement of a pilot block at the bottom of the turret face with ways in the center of the carriage. While this spherical turning cut is in progress, the end of the cylinder head is rough-faced by a tool at the back of the cross-slide.

The combustion chamber is finished by a tool on the third turret face, which is operated in a similar manner to the one on the second face. Then tools on the fourth turret face turn a pilot surface and also finish-face the end of the cylinder head. Finally, tools on the fifth turret face finish-bore the thread and shrink diameters and finish-turn the flange.

Threads are milled on the inside of the head by a Hanson-Whitney machine set up as shown in Fig. 4. The cylinder head is located in a pot type chuck from the finished shoulder at the open end, being clamped against this shoulder in a hardened and ground ring of the chuck by the action of an air cylinder, which forces a plunger against the finned end of the cylinder head. Threads are cut for a width of 1 1/4 inches, twelve per inch, with one movement of the hob around the cylinder head. A tolerance of plus or minus 0.001 inch is specified on the pitch diameter of 5.4332 inches.

After the cylinder heads and barrels have been assembled, they go to the Bryant chucking grinder illustrated in Fig. 5 for grinding the bore of the cylinder barrels. In order to insure accurate positioning of the work in the machine, a large circular adapter with a ground ring is slipped over the ground external surface or skirt at the front end of the cylinder barrel and clamped to the barrel flange. This ground adapter ring fits the hollow machine spindle closely. Likewise, an aluminum casting with four arms that extend radially from the center is clamped to a finished pad on the cylinder

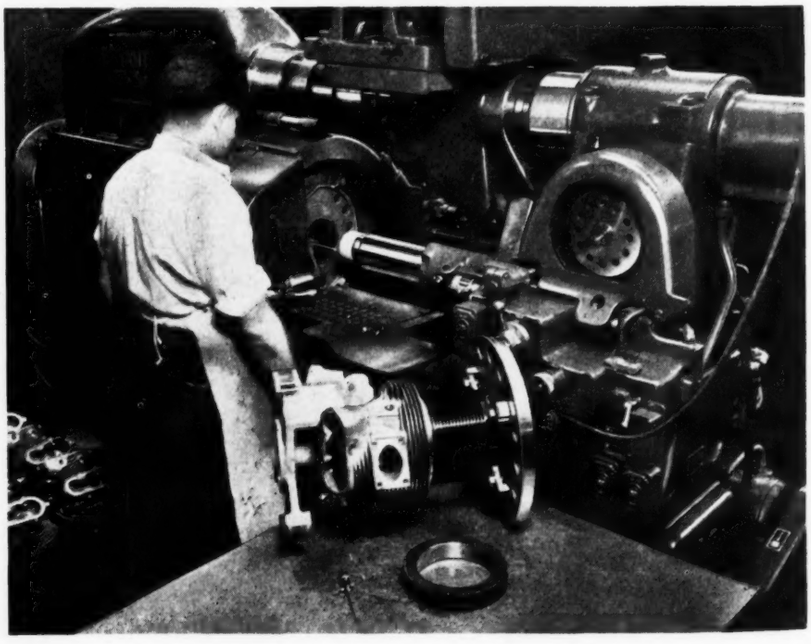


Fig. 5. Chucking Grinder Employed for Rough- and Finish-grinding the Bore of Cylinder Barrels

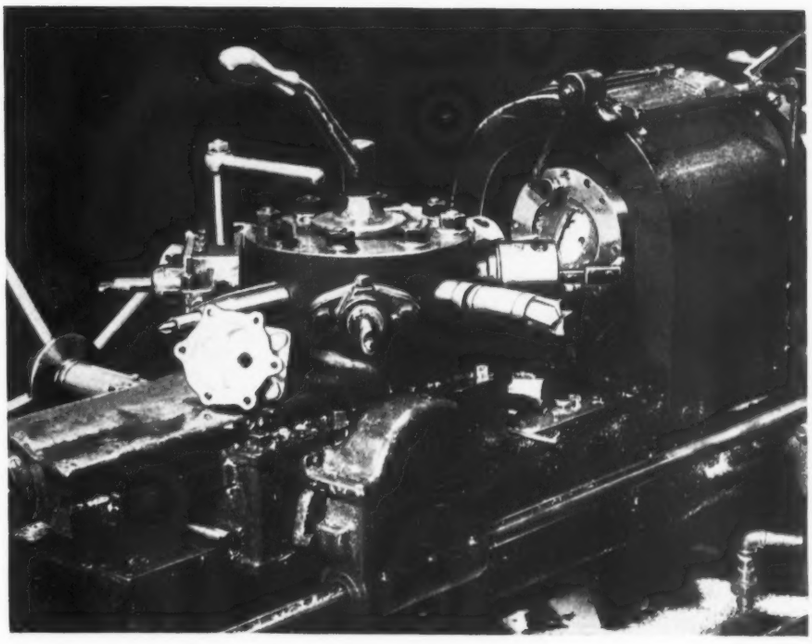


Fig. 6. Turret Lathe Used for Machining the Two Gear Chambers of Pump Bodies within Unusually Close Limits of Accuracy

head. Each arm has a hardened steel insert ground to a radius corresponding with that of the hollow machine spindle, and this insures that the head end of the cylinder assembly will be held accurately in line with the barrel end during grinding.

Approximately 0.025 inch of stock on the diameter is ground from the cylinder barrel bore in this operation, the tolerance on the diameter being 0.001 inch. At the outer end, the cylinder barrel is ground to a taper of 0.0005 inch within this tolerance. Close control of the operation is afforded by an indicator on the front of the machine, which is graduated to 0.0001 inch. The cylinder barrel has a nominal diameter of 5.125 inches, as previously indicated, and is 8 1/2 inches long.

When the machine has been loaded, an air chuck at the left-hand end of the headstock is actuated to bring a plunger against an opening in the aluminum locating casting attached to the cylinder head, so as to deliver coolant to the inside of the work for the grinding operation.

In Fig. 6 is shown a Warner & Swasey turret lathe used for machining the two gear chambers of pump bodies. The headstock is provided with an indexing fixture of eccentric design that enables the work to be shifted horizontally an amount equal to the center-to-center distance between the gear chambers as the work is turned through 180 degrees. An air cylinder locks the two members of the chuck together in the indexed positions.

Ten turret tools are required for this operation, the shaft and stud holes in the centers of the gear chambers being of different diameters, and one shaft hole being bored completely through, while the other hole is blind. The through shaft hole is first drilled, bored, and chamfered, after which the gear chamber is counterbored. Then the blind hole and the second gear chamber are similarly machined.

In this operation, the shaft holes, 0.5625 inch in diameter, must be machined to the specified size within plus or minus 0.0005 inch. The gear chamber must be 1.500 inches in diameter within plus or minus 0.001 inch, and the depth must be 0.500 inch within the same tolerance. The center-to-center distance between the chambers must be 1.174 inches, also within plus or minus 0.001 inch.

The large aluminum fan castings provided on the tank engines are machined complete, except for drilling, on Bullard vertical turret lathes. In the first operation performed on these fans, a flange on the inside at the bottom is bored, and faced on both the top and bottom sur-

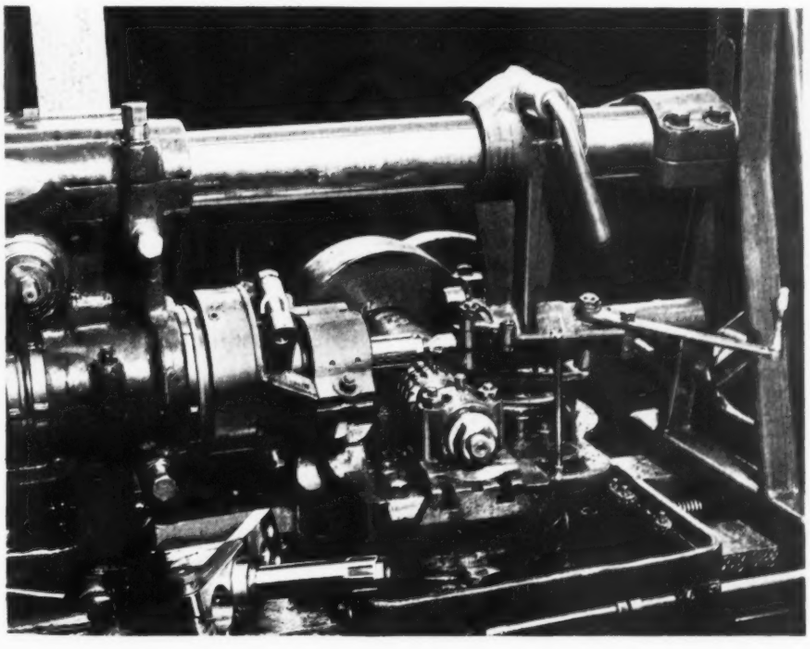


Fig. 7. Hobbing Square Splines on the Rear Section of a Crankshaft for Tank Engines

faces. The facing cut on the bottom flange is taken by a tool that is long enough to extend the full width beneath the flange.

In the operation performed on the second Bullard vertical turret lathe, two large diameters are finish-bored, the upper end of the casting is faced to length, and a circular recess about 1 inch wide is cut completely around the bore. The long bore has a specified diameter of 18.620 to 18.630 inches.

In Fig. 7 is shown a Barber-Colman hobbing machine producing square splines on the rear section of the crankshaft. The cutter is made with four series or rings of teeth, so that long life can be obtained by adjusting the cutter horizontally as any series of teeth becomes worn beyond the desired limits. Six splines, 0.372 inch wide, are cut within plus or minus 0.0005 inch around the crankshaft.

The application of a Reid surface grinding machine for finishing roller slots in the ends of tappets is illustrated in Fig. 8. This machine is equipped with a fixture designed to accommodate twelve tappets. After the tappets have been placed vertically in the fixture, sliding plungers are inserted in holes in the tappets to line them up properly during the tightening of the various clamps. The T-bar is then removed for the operation, during which the slots in the twelve pieces are ground in one traverse past the grinding wheel to a width of 0.250 inch within plus or minus 0.002 inch, and to a depth of approximately 1 inch. The slots were milled in the tappets and the parts heat-treated prior to this grinding operation.

As in building aircraft engines, all steel parts entering the tank engine construction must undergo a Magnaflux inspection, and various parts must be carefully balanced and weighed. The different parts that make up the flywheel and fan assembly are individually and collectively balanced on a machine built by the General Motors Laboratories. This machine is equipped with a device provided with a rectangular diagram on which the amount of any unbalance and the location of any such unbalance are indicated by a light beam that travels down over the diagram as the work is revolved. Corrections for unbalance are made by drilling the work.

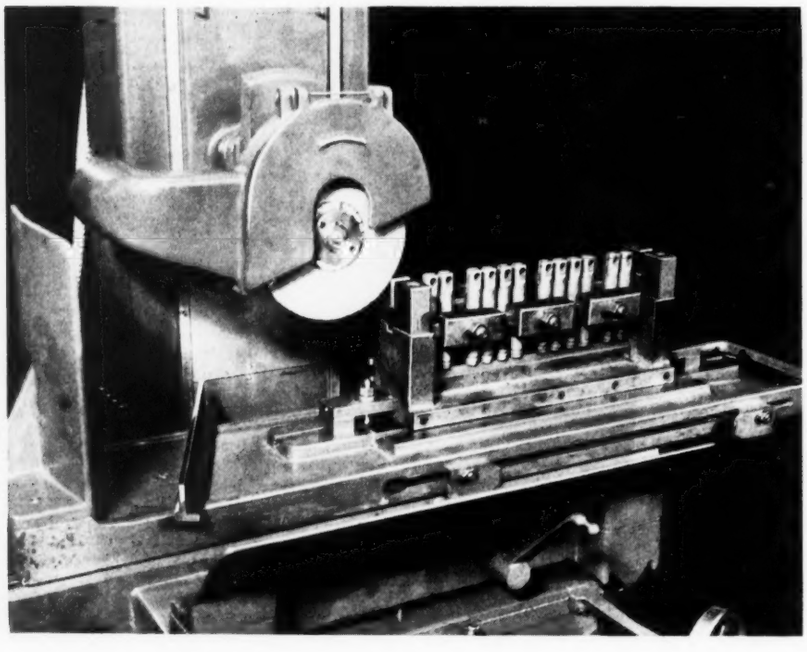


Fig. 8. Grinding Roller Slots in Ends of Tappets, Twelve at a Time

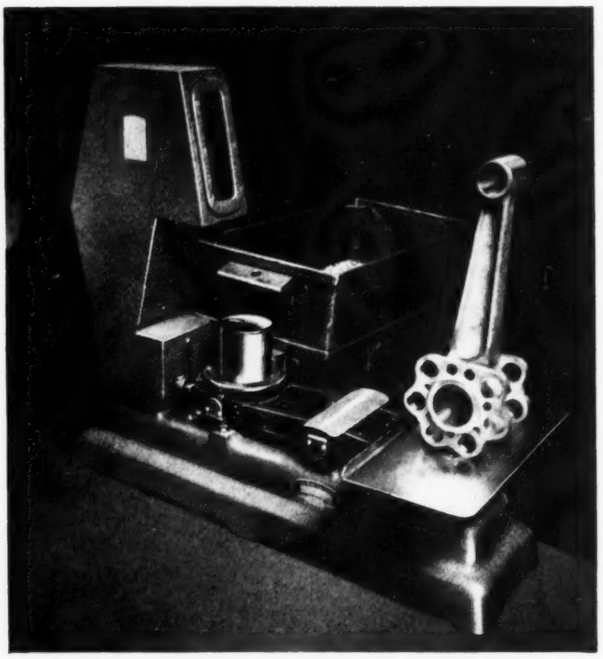


Fig. 9. Checking the Weight of Master Connecting-rods on a Scale that is Calibrated to 0.01 Pound

The hub member of the assembly is first placed in the fixture of the machine and balanced, after which the flywheel, clutch disk, and fan casting are successively assembled and the unit checked for balance after the addition of each part. When completely assembled, this unit weighs 114 pounds, and it must be balanced within one-half ounce-inch. The diameter across the fan blades is 30 inches.

Master connecting-rods must be machined to their specified weight of 5.860 pounds within plus or minus 0.02 pound. They are checked for weight on the "Exact Weight" scale illustrated in Fig. 9. A calibrated weight of the required amount is put on one end of the scale beam, and a master rod is placed upright on the opposite end. Any variation between the calibrated weight and the master connecting-rod is indicated on an illuminated ground-glass scale through the

action of the scale beam against an indicator lever. Lines spaced about 3/8 inch apart on the scale represent weight variations of 0.01 pound.

A general view of the final assembly line is shown in Fig. 1. At the far end of this line, the rear section of a crankcase is bolted to the table of an assembly truck, and the various parts and units of the engine are added as the truck moves progressively along the assembly line. The truck table is mounted on trunnions, so that it can be swung into various positions for the convenience of the assembler. A locking pin that enters dowel-holes on a plate at one end of the table holds the work in the indexed positions. Pans on the bottom of the trucks catch small work-pieces, bolts, nuts, etc., that may fall from the hands of the assemblers. The engines remain on these trucks until shipped to the test shop for the performance tests already described.

Protection of Industrial Plants from Sabotage

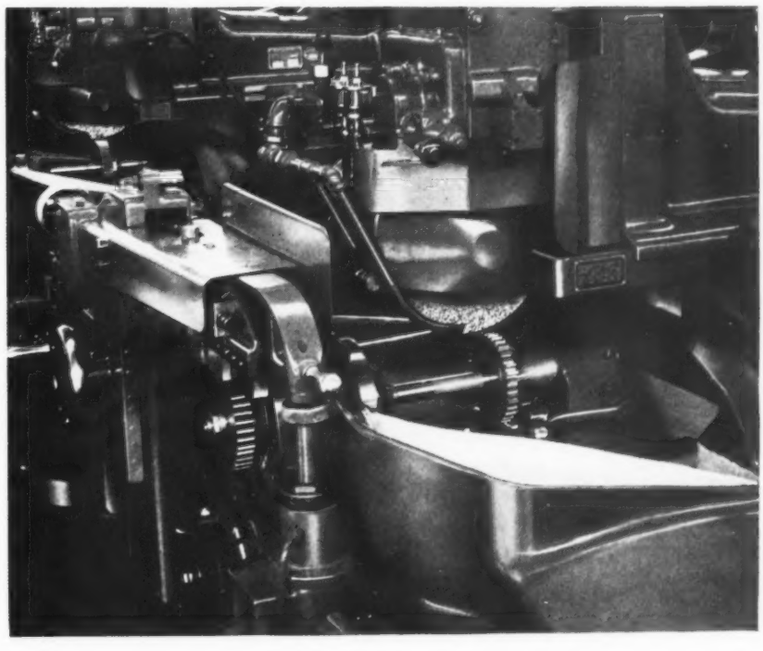
IN a letter addressed to the Associated Business Papers, Inc., John Edgar Hoover, director of the Federal Bureau of Investigation, emphasizes the necessity of protecting our industrial facilities to insure uninterrupted production. The Federal Bureau of Investigation has made a survey of the protective facilities of manufacturing establishments having large contracts to provide the Government with defense material. The first and final responsibility in providing protection against espionage and sabotage lies with industry itself. Only through the alertness of its officials and workers will the full measure of protection, and consequently, the full measure of defense preparedness, be attained.

To assist industrial concerns and municipalities in establishing effective protection against acts of espionage and sabotage, the Federal Bureau of Investigation has prepared a comprehensive booklet entitled "Suggestions for Protection of Industrial Facilities." The distribution of the booklet is limited to heads of duly constituted law-enforcement agencies and executive officials of industrial concerns manufacturing defense materials under Government contracts. Copies will be furnished to such industrial concerns upon written request to the Federal Bureau of Investigation, U. S. Department of Justice, Washington, D. C. The request must be signed by an executive official.

* * *

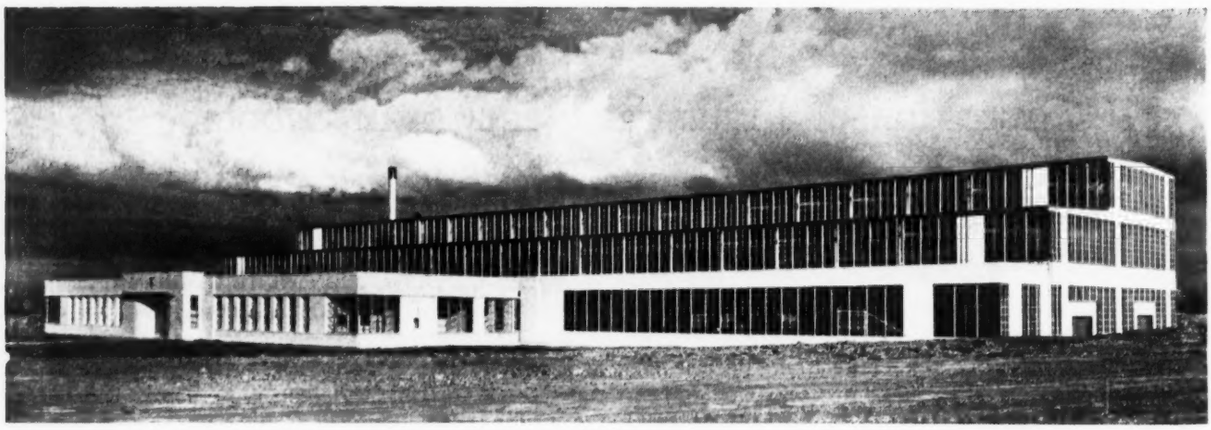
Gear Manufacturers Report Production Steadily Rising

The American Gear Manufacturers Association reports that gear sales for the month of October were 18 per cent above those for September, and 53 per cent above those for October, 1939. The sales for the ten months ending with October, 1940, were 47 per cent above the corresponding period last year.



Grinding the Teeth of Spur Gears for Pratt & Whitney Aircraft Engines on a Pratt & Whitney Two-wheel Gear-tooth Grinding Machine

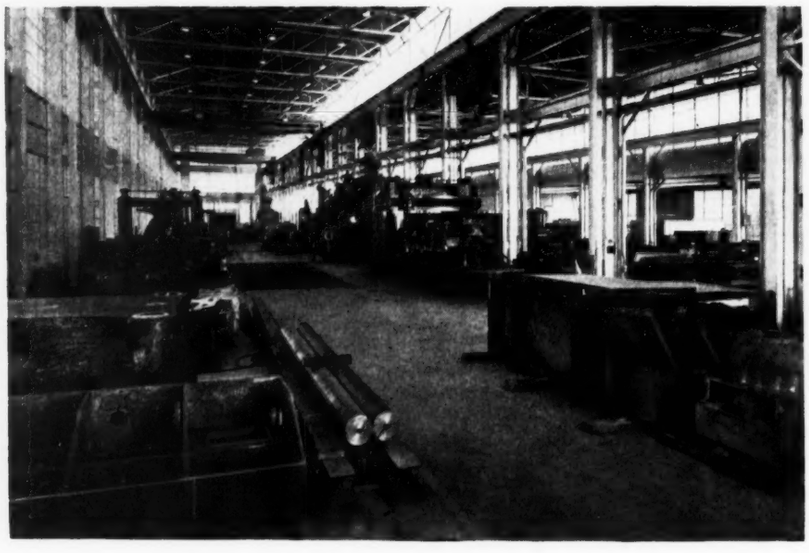
New Plant Doubles Capacity of Press Manufacturer



New Plant of the Hydraulic Press Mfg. Co. at Mount Gilead, Ohio, Having More than 60,000 Square Feet of Manufacturing Space. The Plant was Erected by the Austin Co., of Cleveland

THE new plant recently put into operation by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, was constructed not only to make it possible to build a larger number of presses in a given length of time, but also to provide facilities for constructing much larger machines than the company has built in the past. The plant efficiency will also be greatly improved because of the straight-line production lay-out and the new machine tool equipment installed.

The plant is 400 feet long, and has three bays, each with gradually increasing head-room. The first bay is used for the storage of materials, tools, and finished parts, as well as for the shop offices. It has the ordinary factory head-room. The second or intermediate bay is 40 feet wide with 22 feet of head-room underneath the crane hooks, and is served by two 15-ton cranes. The third or highest bay is 55 feet wide with a clearance of 36 feet under the crane hooks. This bay is served by two 50-ton cranes which can operate together for single lifts, so that castings as heavy as 200,000 pounds can be handled. The plant is so built that additional bays can be conveniently added next to the high bay, and it can also be extended endwise in one or both directions, with a minimum of disturbance to the plant.



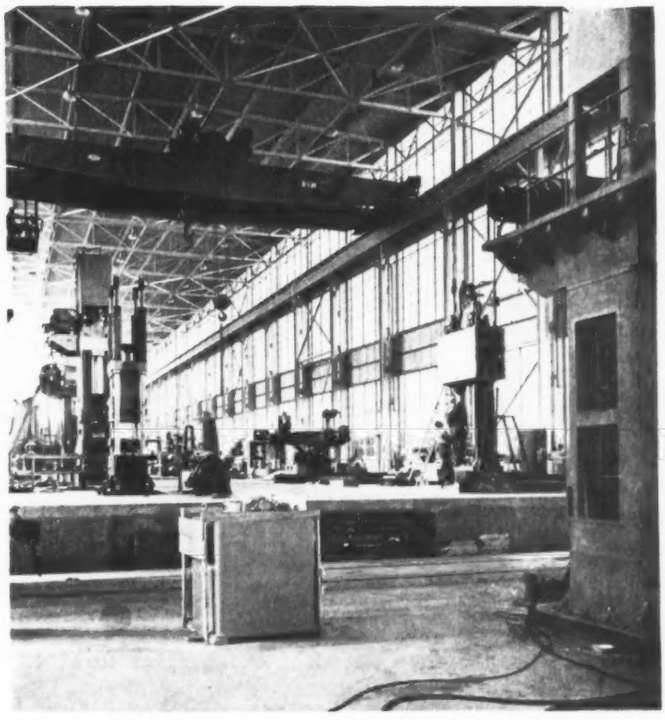
Castings, Some Weighing up to 100 Tons, are Finished in This Bay, which is Served by Two 50-ton Traveling Cranes. Some of the Castings Shown are for 5000-ton and 2500-ton Presses

The production and assembly work are carried out in the two high head-room production bays. The castings and other raw materials enter at one end. Truck entrances are provided at the end of each bay. There is also a railroad track crossing both bays at the entering end of the plant, where all preliminary work on castings, steel plate, and other materials is performed.

The work moves progressively to the shipping end of the plant,

various machining and assembly operations being performed as it moves along. The final assembly work is done at the shipping end of the production bays. For a length of 60 feet at this end of the plant, the floor is 4 feet lower than in the rest of the plant. A railroad track enters the building on the lower level, which means that the main building floor is on a level with the railroad car floor on one side. The lowering of the floor level at this end of the plant also increases the effective head-room under the cranes in both bays by 4 feet, giving additional height for the erection of extremely tall presses.

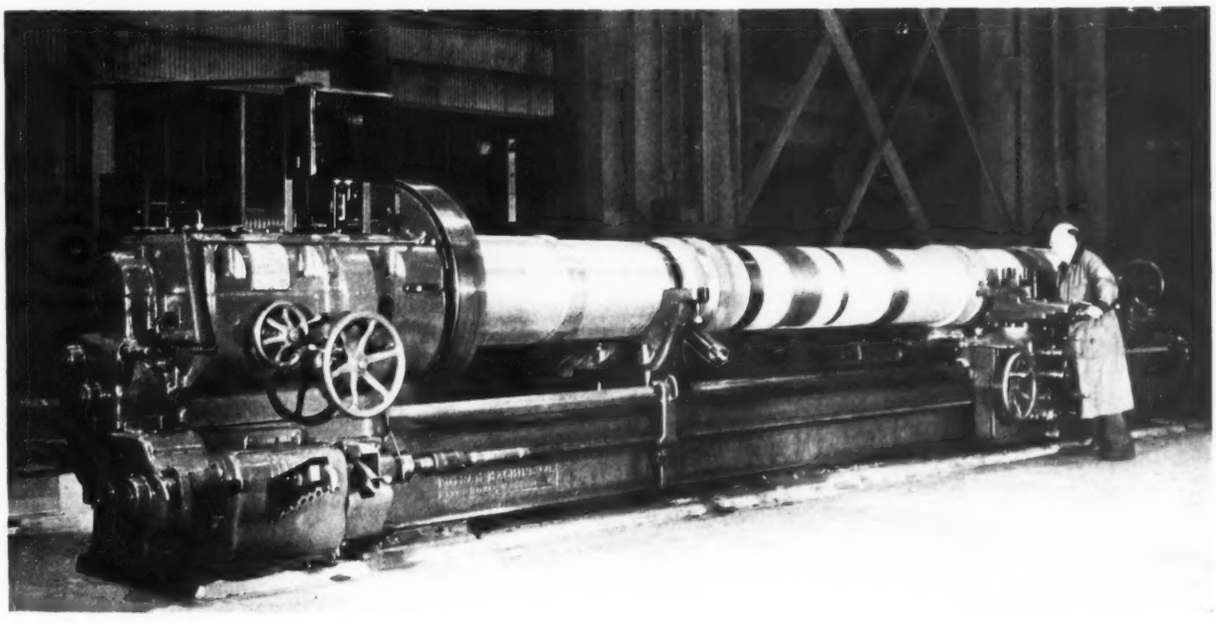
One of the interesting features of the plant is the provision made for handling the large volume of oil used in the testing of hydraulic presses. A 5000-gallon two-compartment oil storage tank is located under ground. A system of oil-pipe lines running to every building column in the assembly area provides means for filling any press with oil by simply connecting an oil-hose to the nearest oil outlet. After the press has been tested, the oil in the press tank is drained back into the oil system, returning by gravity to the second tank compartment. From there, the oil is transferred to the other compartment to be used again, but all impurities and moisture are removed during the transfer.



Presses of Exceptional Height are Assembled on a Lower Level at One End of the Plant; Those of More Normal Size are Assembled on the Main Working Floor, as Shown

A separate office building, 180 by 50 feet, adjoins the plant at the front. This is a one-story structure connected with the plant through an enclosed passage.

A few words about the history and development of the Hydraulic Press Mfg. Co. may be of interest. Its line of hydraulic presses is the direct result of some sixty-three years of specialization in this field. The organization began operations in Mount Gilead, Ohio, in 1877, the first hydraulic presses having been designed for the fruit-juice industry.



One of the Large Machine Tools Installed in the New Plant of the Hydraulic Press Mfg. Co. The Tie-rod for a Large Press, which is Shown Here Being Turned, is 280 Inches Long, 22 Inches in Diameter, and Weighs 28,000 Pounds

Shortly after 1900, the organization came under the leadership of the late Frank B. MacMillin, under whose guidance the company developed hydraulic presses for a great number of other purposes—meat-packing plants, grease-rendering plants, veneer manufacture, railroad shops, rayon factories, salt industry, and abrasive-wheel manufacture.

In 1927, a new method of press operation and control was introduced by the company, which adapted the hydraulic press for high-speed mass production in the metal-working industries. This method of press operation and control is known as the H-P-M Fastraverse system.

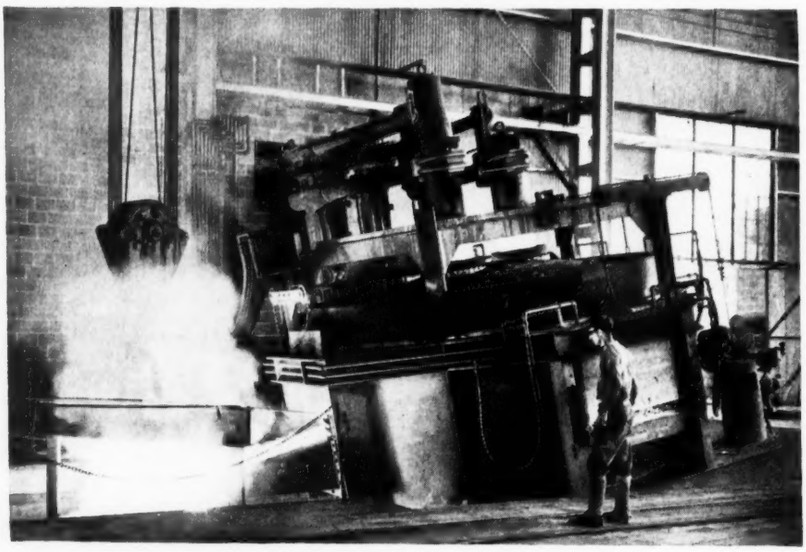
More recent developments have been double-action presses for metal-working; triple-action presses for deep-drawing of sheet metal; plastic injection molding presses; presses especially developed for the aircraft industry; presses for forging hot billets of steel, as in the manufacture of high-explosive shells; and, in general, equipment for the automotive, agricultural, electrical, foundry, chemical, and National Defense industries.

Rustless Iron & Steel Corporation Greatly Expands Plant

SOME six hundred steel executives, stainless steel fabricators, jobbers, distributors, and others were guests of the Rustless Iron & Steel Corporation on November 8, in Baltimore, Md. The visitors had been invited to inspect a new $2,500,000 addition to the company's plant, which is devoted exclusively to the production of stainless steel. This event marked the completion of an expansion program inaugurated in 1935, which has been shortened to meet the requirements of a four-fold increase in the demand for the corporation's products. The program involved the demolition of practically all former buildings to make way for larger and more modern structures. In addition to erecting new buildings, the plant has been almost entirely equipped with new machinery.

In 1935, the principal producing equipment consisted of three 6-ton electric furnaces, a 20-inch rolling mill, and a five-stand 9-inch bar and rod mill; the melting capacity was 20,000 tons of ingots. Melting facilities were changed in 1935 from the original three 6-ton furnaces to three of 12 tons each. Two 16-ton furnaces were added in 1940, which increased the annual melting capacity to 75,000 tons, nearly four times the capacity of five years ago.

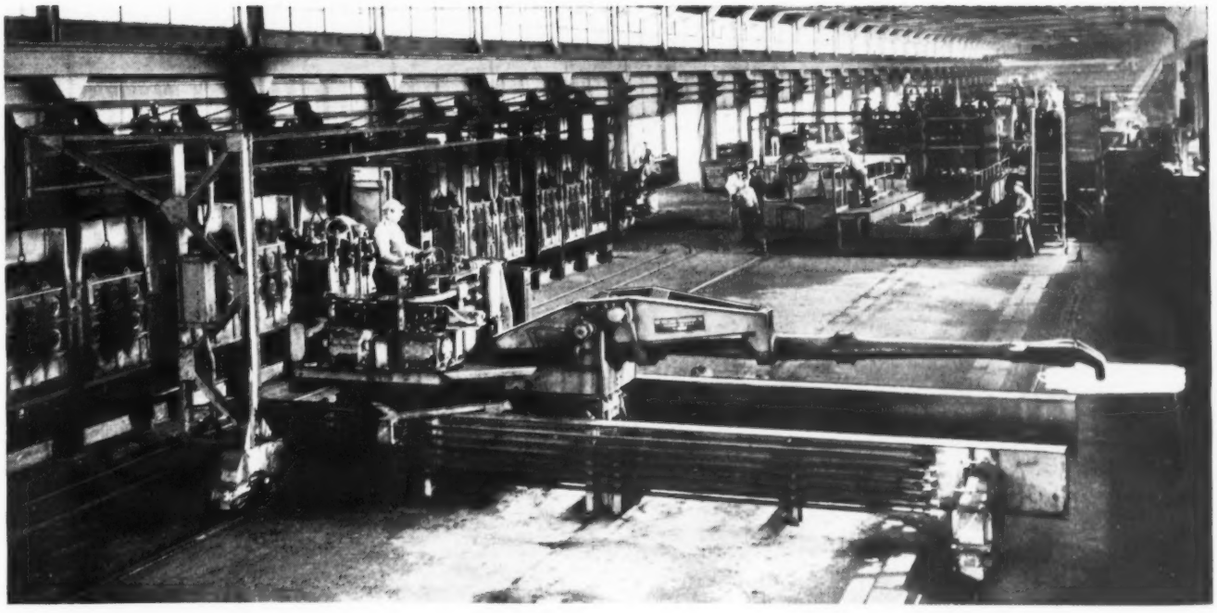
To the 20-inch and 9-inch mills that the corporation had in 1935 was added a 12-inch bar mill in 1937. A 28-inch mill has been added this year for the production of billets, sheet bars, and slabs, as well as a three-stand 12-inch mill and a seven-stand 9-inch mill for producing bars or coils.



One of Five Electric Furnaces in the New Rustless Iron & Steel Corporation's Melt Shop, which Have an Aggregate Melting Capacity of 75,000 Tons of Stainless Steel a Year

Equipment added to the cold-finishing department has more than doubled production, not including the new cold-roll mill for the production of special bar and wire shapes. The finished bar and wire capacity is now about 1500 tons a month — between four and five times the capacity five years ago, when the expansion program was started. Other operations have been increased proportionately.

It is of interest to note that a straight-line production system is employed, so that the products pass in a straight flow through the plant, thus eliminating superfluous movements of men and materials. Production operations on bars and wire, from ingot heating to shipping, are carried on within a single 1800-foot building.



The Start of the Production Line, where Hot Stainless-steel Ingots are Withdrawn from the Heating Furnace and Move down the Length of This Modern 1800-foot Structure, to be Rolled into Billets and Bars, and Drawn into Wire

The corporation's method of stainless steel manufacture employs melting and other processes covered by patents that have been developed by its own chemical and metallurgical engineers. The exclusive melting processes permit the direct reduction from chrome ore of the chromium which gives stainless steel its characteristic quality. There are three sources of chromium—first, natural chrome ore; second, ferro-chrome (chrome ore melted once for enrichment and purification); and third, stainless scrap containing chromium. The corporation's processes enable it to produce stainless steel from any one of these three types of raw material, or from combinations of the three. The corporation has been a pioneer in the development and use of chrome ore produced from deposits in the United States, and has been the sole user of domestic chromite for a number of years.

* * *

Should Manufacturers and Unions be Equally Responsible?

Congress has passed a law giving the President power to take over any manufacturing plant if, in his opinion, the owners are retarding or obstructing the Defense Program. Has Congress conferred upon the President equal powers to take action when a labor union retards or obstructs the National Defense work? This question is pertinent in view of recent cases in which aircraft production has been slowed up by the action of labor unions. It would seem reasonable to expect that in the present emergency all groups of citizens should share responsibility equally.

Regular Can-Opener Used for Cutting Sheet Metal in the Shop

By W. F. SCHAPHORST

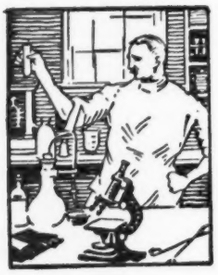
An ordinary can-opener can be conveniently used for cutting openings in sheet metal and even for cutting sheet metal in two. Sometimes the writer has found a can-opener more convenient than a pair of metal shears or other methods commonly used. The difficulty with shears is the interference of the metal with the hand and the fact that the metal must be bent away to some extent, in order to allow the shears to be passed through.

When cutting a hole in sheet metal with the can-opener, simply punch a hole with the point, just as when opening a can, and proceed. To cut out an ellipse, circle, or any other shape becomes a comparatively simple matter.

* * *

Stainless steel is being used to an ever increasing extent for industrial applications. One of the West Coast airplane-building concerns, for example, during the first nine months of the year, used about 2,000,000 pounds of stainless steel for non-structural parts alone. These corrosion-resistant metals are also being increasingly used in streamlined trains, as well as in truck construction, since they reduce the dead weight and thus increase the pay-load capacity. A large trailer company recently ordered 10,000 stainless-steel freight trailer bodies requiring an estimated tonnage of 18,000,000 pounds over a three-year period.

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Synthetic Rubber Solves Design Problem in Contour Sawing Machine

In developing a contour sawing machine, the designers of the Continental Machines, Inc., Minneapolis, Minn., made use of Neoprene (a synthetic rubber) for the covering of the wheels over which the band saw travels. A resilient tire was required to ease the shock on the saw band caused by temporary sticking, and to protect the teeth of the saw. However, in sawing certain materials, such as soft copper, duralumin, etc., the saws are lubricated, and the question arose as to whether or not natural rubber tires would withstand the abrasion and cutting of the saw blades when soaked in oil. Abrasion occurs through slight slipping of the saw blade across the tire and by chips being carried under the saw band, while the edges of the swaged teeth may cut the tire.

It was also feared that the generation of heat during extended operation of the saw would deteriorate the rubber tires. An accelerated wear test revealed that a rubber tire would wear more than twice as fast as a Neoprene tire, and as a result Neoprene tires were specified. 201

Spring Wire Developed to Meet Special Requirements

What is known as "Electromatic" oil-tempered spring wire is now being produced by the Jones & Laughlin Steel Corporation, Pittsburgh, Pa. Instead of using the conventional method of heating wire to the quenching temperature, either in a furnace or by immersion in a molten bath, this wire is tempered by passing sufficient electric current through it to heat it to the desired temperature. The electrical resistance set up in the wire raises the temperature uniformly, and the full cross-section of the wire is heated simultaneously to the desired quenching temperature. Special equipment has been developed for tempering spring wire in this manner, the quenching being so arranged that there is a gradual reduction in the wire temperature, thus preventing the steel from being "shocked" by a sudden drop in temperature.

The increasing demand for spring wire of more uniform physical properties has been largely responsible for the development of the new process, its fundamental advantages being the exactness by which all factors affecting the physical properties and fatigue values of the wire can be controlled. This type of spring wire has found widely diversified uses, as, for example, in brake springs; clutch springs; airplane construction; farm machinery springs, etc. 202

A Wiping Solder with Improved Handling Characteristics

A new wiping solder consisting of 37.25 per cent tin, 0.10 per cent arsenic, and the remainder lead, developed primarily for joining lead sleeves to cable sheaths in splicing operations, is described in the *Bell Telephone Laboratories Record*. The addition of a small quantity of arsenic makes possible a longer period of manipulation for wiping and molding the solder into the desired form and smoothness. The improved quality of this solder is the result of a finer grain structure and little tendency to oxidize even at high working temperatures.

Investigation has shown that no industrial hazard is introduced by substituting arsenic-bearing solder for the standard type of solder. 203

Protective Coating for Aluminum and Aluminum Alloys

A non-electrolytic, simplified method of producing a hard, smooth, corrosion-resistant coating, integrally fused, on aluminum and aluminum alloys has been developed by the Colonial Alloys Co., Philadelphia, Pa. No electric currents, electrical equipment, or special tanks are required, as the process is substantially one of simple immersion. The use of heat is optional, and time is not a critical factor, ranging from five minutes to twenty hours. Degreasing and cleaning, usually so necessary in most metal protection processes, are dis-

To obtain additional information about materials described on this page, see lower part of page 154.

pensed with. The resulting surface provides an excellent base for paints, lacquers, oils, chemicals, dyes, and other sealers. It is applicable to Colallov and Colalloy alloys, as well as to aluminum and its alloys in all their forms. 204

New Applications of Nickel-Alloy Cast Irons

Specially processed high-strength irons to which nickel and other alloys are added are increasing in popularity. Nickel-alloy truck and airplane brake-drums have shown a life several times longer than plain cast iron. Tensile strengths exceeding 70,000 pounds per square inch have been secured. Applications include gears, crankshafts, machinery frames, hydraulic pressure castings, and roughing, shaping, and billet mill rolls. 205

Aluminum Sand-Casting Alloy Used without Heat-Treating

A copper-tin-magnesium-zinc alloy of aluminum has been developed to meet the specifications for most commonly used heat-treated castings by the National Bronze and Aluminum Foundry Co., Cleveland, Ohio. This T-1 alloy can be used without heat-treating and quenching, and can be welded without deterioration in physical properties. Exhaustive tests have shown that this alloy, without heat-treatment, has the following properties: Tensile strength, 30,000 to 33,000 pounds per square inch; elastic limit, 16,000 to 25,000 pounds per square inch; elongation in 2 inches, 6 to 10 per cent; Brinell hardness, 60 to 78; weight per cubic inch, 0.1003 pound.

Tests indicate that T-1 alloy has approximately the same resistance to salt water corrosion as U. S. Navy Alloy 46 Ale-4. It will also meet all requirements of U. S. Air Corps Specifications 11324 and 11325, and Navy Aeronautical Specifications M-397.

Melting is done in the ordinary way with the flux used for other aluminum alloys, and casting is done at customary room atmospheric conditions. 206

Vinylidene-Chloride Plastics with Unusual Properties

Compounded from crude oil and brine, a new group of thermoplastic resins based on vinylidene chloride has been introduced by the Dow Chemical Co., Midland, Mich., under the trade name "Saran." This group of materials ranges from a flexible moderately soluble material with a softening point of 70 degrees C. to a hard, tough thermoplastic solid having a softening point of at least 180 degrees C.

To a greater or lesser degree, these resins exhibit crystallinity of structure. Normally these crystals are arranged in a homogeneous manner, and the plastic has ordinary properties. Under proper conditions, however, the fibrous crystals may be oriented into an orderly linear pattern, resulting in a tensile strength of 60,000 pounds per square inch, with greatly increased flexibility. Even more striking is the resistance to fatigue. In a series of tests, this resin withstood 250,000 flexes through an angle of 180 degrees over a 1/8-inch mandrel without breaking.

"Saran" will not burn; it is odorless, tasteless, non-toxic, and is characterized by extreme chemical resistance. It has a high index of refraction, and almost any shade of color and degree of opacity can be obtained. When used in the form of strong, flexible, rattan-like strands, it makes an attractive and durable seat covering for buses and subway cars. Woven bulkhead panels of this material are now being used in a number of air liners. It has also found application as a resinous bonding agent in a new type of abrasive wheel. It can readily be formed into extruded tubing and other shapes, and is suitable for the production of articles by compression and injection molding. 207

Wrenches of Great Strength Made from Chromium-Molybdenum Steel

"Striking" wrenches are often required to remove nuts from bolts located in cramped quarters or otherwise difficult to loosen. As the "striking" type of wrench is designed to be placed on the nut and then hit with a sledge, it calls for a steel with sufficient hardness to prevent burring or wear, and enough strength to prevent deformation and fracture.

Such a type of wrench, as produced by the Plomb Tool Co., Los Angeles, Calif., is made from chromium-molybdenum steel (SAE 4140). Its properties are obtained by the following heat-treatment: After forging, the wrenches are normalized from 1625 to 1650 degrees F. to remove forging strains. They are then quenched in oil from 1550 degrees F., and drawn at about 1000 degrees F. This treatment develops a hardness of about 35 Rockwell C, combined with high yield strength and excellent impact strength. 208

Improved Alloy Steel for Dies or Tools

A chromium-molybdenum-vanadium type of steel has recently been developed by the Jessop Steel Co., of Washington, Pa., for use where the initial cost of tools or dies must be held to a minimum. This improved alloy steel, known as Windsor Special air-hardening die steel, is non-deforming, easily machined, extremely tough, and has a wide hardening range. It can be hardened or tempered in either oil or air. 209

To obtain additional information about materials described on this page, see lower part of page 154.

NEW TRADE LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts and Materials. To Obtain Copies, Check on Form at Bottom of Page 153 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the December Number of MACHINERY

Production Data

SUN OIL CO., Philadelphia, Pa. 60-page booklet entitled "Cutting and Grinding Facts," containing performance data on the latest types of lathes, milling machines, hobbers, drills, and grinding machines, covering forty-eight different metal-working operations. The information given includes operation, materials machined, spindle speed, depth of cut, feed and cutting lubricant—data which should be of value to the operator and production executive in obtaining maximum efficiency. 1

Machining Steel with Carboloy Tools

CARBOLOY COMPANY, INC., 11147 E. 8 Mile Road, Detroit, Mich. Engineering Bulletin GT-123, devoted to the machining of steels with cemented-carbide tools, containing data on feeds, speeds, depth of cut, and grade selection for different types of steels, as well as recommendations on grinding relief angles for tools and grinding chip-breakers. 2

Toggle-Clamp Templets

DETROIT STAMPING CO., 362 Midland Ave., Detroit, Mich., is offering, free of charge, to tool designers making the request on their employer's letter-head, a toggle-clamp templet kit containing eighteen different templets which enable a designer to select the proper toggle clamp for a fixture, to suit any particular condition, and trace it in a few minutes in the correct position on a drawing without figuring. 3

Precision Equipment

PRATT & WHITNEY DIVISION NILES-BEMENT-POND CO., West Hartford, Conn. Booklet entitled "Accuracy—A Word that Became an American Creed," containing reprints of a series of advertisements showing how increased accuracy of machines and tools has speeded up production, improved quality, and lowered costs in a variety of products. 4

Electric Equipment

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Descriptive Data 49-200 on Type FP capacitor rack and switching equipment for indoor and outdoor service. Descriptive Data 3808, on Simpac power units for out-of-the-way localities or specialized industrial applications where alternating-current power is not readily available. 5

Hobbing Data

BARBER-COLMAN CO., 203 Loomis St., Rockford, Ill. Loose-leaf book containing a collection of case histories of actual field performance of Barber-Colman hobbing machines and hobs, covering feeds, speeds, production time, hob life, etc. 6

Rustless Iron and Steel

RUSTLESS IRON AND STEEL CORPORATION, Baltimore, Md. Booklet commemorating the completion of a plant enlargement program started in 1935, showing various interior views in the company's plant and describing, step by step, the production of stainless steel 7

Aluminum Casting Alloys

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. Booklet containing much useful information on aluminum casting alloys, covering melting, molding, and finishing; design of aluminum alloy castings; and a description of the different alloys. 8

Seamless-Steel Tubing

SUMMERILL TUBING CO., Bridgeport, Montgomery Co., Pa. Bulletin entitled "Taking 'Specials' in Stride," describing the company's facilities for making special seamless-steel tubing in commercial quantities. 9

Turret Lathes and Automatics

GISHOLT MACHINE CO., 1209 E. Washington Ave., Madison, Wis. Performance Data Sheets Nos. 62 to 64 giving complete production data on three representative metal-turning jobs handled on Gisholt automatic lathes and turret lathes. 10

Carbide Tools and Blanks

VANADIUM-ALLOYS STEEL CO., VASCOLOY-RAMET DIVISION, North Chicago, Ill. Circular containing information on Vascoloy-Ramet tools, including recommended grades and speeds for machining different classes of materials. 11

Hydraulic Lathe with Shell-Turning Carriage

MOREY MACHINERY CO., INC., 410 Broome St., New York City. Circular 679, illustrating and describing the Morey "27" heavy-duty hydraulic lathe, with finger-tip control and shell-turning carriage. 12

Band Saws

DOALL CO., 1201 Thacker St., Des Plaines, Ill. Booklet entitled "Do-All Saws" containing actual performance records of these saws on different materials and jobs; includes chart for selecting right saw and speed for various materials. 13

Furnace Pressure Control

LEEDS & NORTHRUP CO., 4921 Stenton Ave., Philadelphia, Pa. Catalogue N-01A-600, describing important new features of the Leeds & Northrup pressure control system for industrial furnaces. 14

Vertical Miller and Die-Sinker

REED-PRENTICE CORPORATION, Worcester, Mass. Catalogue 18-602-8, describing the construction features of the new Reed-Prentice No. 6 vertical miller and die-sinker with gear drive to spindle. 15

Flexible Metallic Tubing

PENNSYLVANIA FLEXIBLE METALLIC TUBING CO., 72nd St. and Powers Lane, Philadelphia, Pa. Bulletins 52-G and 59-G on Penflex bronze steam hose and clincher couplings,

and Penflex galvanized-steel hose and couplings, respectively. 16

Indicating and Controlling Instruments

BROWN INSTRUMENT CO., Wayne and Roberts Aves., Philadelphia, Pa. Catalogue 6706, on Brown thermometers and pressure gages for indicating, recording, and controlling processing operations. 17

Turret Lathe Tools

WARNER & SWASEY CO., Cleveland, Ohio. Catalogue entitled "How to Get More Production from Your Present Turret Lathes," describing several turret lathe tools designed to increase production. 18

Electrode Selector Chart

AIR REDUCTION SALES CO., 60 E. 42nd St., New York City. Electrode selector chart for arc-welding operators, designed to simplify the selection of the proper electrode for a given job. 19

Welding of Nickel Alloys

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City. Bulletin T-2, containing technical information covering the welding, brazing, and soft soldering of Monel, nickel, and Inconel. 20

Electric Motors

RELIANCE ELECTRIC & ENGINEERING CO., Ivanhoe Road, Cleveland, Ohio. Bulletin 119, illustrating and describing Reliance Type AA ball-bearing squirrel-cage induction motors. 21

Ampco Metal

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee, Wis. Booklet containing brief facts about Ampco metal, a copper, high-aluminum, high-iron alloy suitable for bushings, bearings, gears, and similar applications. 22

Munitions Threading Equipment

LANDIS MACHINE CO., INC., Waynesboro, Pa. Catalogue describing Landmaco threading machines and their use in tapping shells and threading fuse bodies, as well as other munitions parts. 23

Electric Furnaces

AJAX ELECTRIC CO., INC., Frankford Ave. and Allen St., Philadelphia, Pa. Catalogue 107, describing the Ajax-Hultgren electric salt bath furnace, and giving detailed data on all heat-treating applications. 24

Electric Equipment

ELECTRIC CONTROLLER & MFG. CO., 2706 E. 79th St., Cleveland, Ohio. Circulars illustrating and describing the new EC&M Type LWZ welder contactors, and the interrupted type timer for welding. 25

Punch Presses

DAVID J. ROSS CO., Benton Harbor, Mich. Circular describing the economies effected by the use of the Rousselle punch presses, which are designed especially to obtain speed, combined with safety, in handling the smaller classes of work. 26

Protective Cream for Industrial Use

MAGNUS CHEMICAL CO., Garwood, N. J. Illustrated folder on Magnus "Skin-Gard," a cream for protecting the skin of workmen against chemicals, solvents, and dirt. 27

Drilling Machines

BUFFALO FORGE CO., Buffalo, N. Y. Bulletins 3257 and 3285, descriptive of two new Buffalo drilling machines, one known as the "RPMster," and the other as the "motor-spindle" drill. 28

Electric Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y. Bulletins GEA 2753 and 3020A describing, respectively, GE instruments and time switches, and electrostatic voltmeters. 29

Kennametal Tools

MCKENNA METALS CO., 147 Lloyd Ave., Latrobe, Pa. Price List 5, covering Kennametal-tipped tools, Kennametal blanks, milling cutters, and lathe and grinder centers. 30

Pillow Blocks

SHAFER BEARING CORPORATION, 35 E. Wacker Drive, Chicago, Ill. Bulletin 526, on the Shafer line of pil-

---

To Obtain Copies of New Trade Literature

listed on pages 152-154 (without charge or obligation), mark with X in the squares below, the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail to:

MACHINERY, 148 Lafayette St., New York, N. Y.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	

Name ..... *Position or Title* .....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

Firm .....

Business Address .....

City ..... *State* .....

[SEE OTHER SIDE]

low blocks, equipped with self-aligning radial-thrust roller bearings. 31

Abrasive Cut-Off Wheels

NORTON CO., Worcester, Mass. Catalogue containing information on the characteristics, selection, and application of Norton abrasive cut-off wheels. 32

Single-Beam Cranes

SHEPARD NILES CRANE & HOIST CORPORATION, Montour Falls, N. Y. Bulletin 130, covering the Shepard Niles line of single-beam cranes. 33

Coolant Pumps

WARREN STEAM PUMP CO., INC., Warren, Mass. Bulletin describing a new coolant pump known as "Coolflo," designed especially for the machine tool industry. 34

Material-Handling Equipment

ELWELL-PARKER ELECTRIC CO., 4205 St. Clair Ave., Cleveland, Ohio. Bulletin entitled "How to Save Money Handling Your Loads." 35

Electrical Connecting Devices

HOWARD B. JONES, 2300 Wabansia Ave., Chicago, Ill. Bulletin 500, describing this company's new line of power plugs and sockets. 36

Oilless Bearings

NEVEROIL BEARING CO., Wakefield, Mass. Catalogue containing data on the characteristics, operating conditions, and installation of Neveroil oilless, self-lubricating bearings. 37

Tempering and Drawing Furnaces

DESPATCH OVEN CO., Minneapolis, Minn. Bulletin 83, descriptive of Despatch furnaces for tempering and drawing tools and dies. 38

Material-Handling Equipment

C. O. BARTLETT & SNOW CO., Cleveland, Ohio. General catalogue No. 90, containing 372 pages of data on Bartlett-Snow elevators and conveyors, chains and sprockets, etc. 39

Plastics

DUREZ PLASTICS & CHEMICALS, INC., North Tonawanda, N. Y. Pamphlet entitled "It's a New Business Custom," describing the use of Durez for a wide variety of products. 40

Filing Stainless Steel

NICHOLSON FILE CO., Providence, R. I. Bulletin describing files designed for use on stainless steel, and methods of using them. 41

Hydraulic Couplings

AMERICAN BLOWER CORPORATION, Detroit, Mich. Bulletin descriptive of traction type hydraulic couplings for industrial and marine service. 42

Hoists and Controls

READING CHAIN & BLOCK CORPORATION, Reading, Pa. Catalogue 58, containing data, including prices, on the Reading line of hoists, trolleys, chain blocks, and chain sheaves. 43

Steel Office and Factory Equipment

ALL-STEEL-EQUIP CO., Aurora, Ill. Catalogue 184, containing data on shop boxes and stack units, which are designed to save time in handling small parts. 44

Gun-Barrel Grinding Machines

LANDIS TOOL CO., Waynesboro, Pa. Bulletin illustrating and describing Landis precision hydraulic grinders for rifle and machine-gun barrels. 45

V-Belt Drives

B. F. GOODRICH CO., Akron, Ohio. 170-page V-belt data book, covering V-belt drives for all classes of machines. 46

Offset Boring Heads

FRAY MACHINE TOOL CO., Glendale, Calif. Circular containing information on Fray micrometer offset boring heads. 47

Electric Furnaces

HEVI DUTY ELECTRIC CO., Milwaukee, Wis. Bulletin HD-940, featuring the "Hevi Duty" carburizer. 48

Hydraulic Lift-Trucks

LYON IRON WORKS, Greene, N. Y. Bulletin 117, on Lyon hydraulic lift-trucks of the pallet type. 49

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 155-170 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment mark with X in the squares below, the identifying number found at the end of each description on pages 155-170 — or write directly to the manufacturer, mentioning machine as described in December MACHINERY.

51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	

Fill in your name and address on other side of this blank.

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 150-151, mark with X in the squares below, the identifying number found at end of each description on pages 150-151 — or write directly to the manufacturer, mentioning name of materials as described in December MACHINERY.

201	202	203	204	205	206	207	208	209

Fill in your name and address on other side of this blank.

Detach and Mail to MACHINERY, 148 Lafayette St., New York, N. Y.

[SEE OTHER SIDE]

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Gleason Straight Bevel-Gear Rougher

The rough-cutting of straight bevel gears by a new method developed to produce correctly tapered tooth-slots at a high production rate can be accomplished on a machine recently built by the Gleason Works, 1000 University Ave., Rochester, N. Y. This new machine is designated the No. 7 straight bevel-gear rougher, and is adapted for either large or medium quantity production. It is suitable for rough-cutting straight bevel gears with pitch diameters up to 14 inches, tooth sizes up to 3 diametral pitch, and face lengths up to 2 inches, having a ratio of 6 to 1 with the shafts at an angle of 90 degrees. The indexing range covers any number of teeth from 13 to 100, the range in cutter speeds is from 75 to 160 feet per minute, and the feeding rate is from 4 to 33 seconds per tooth.

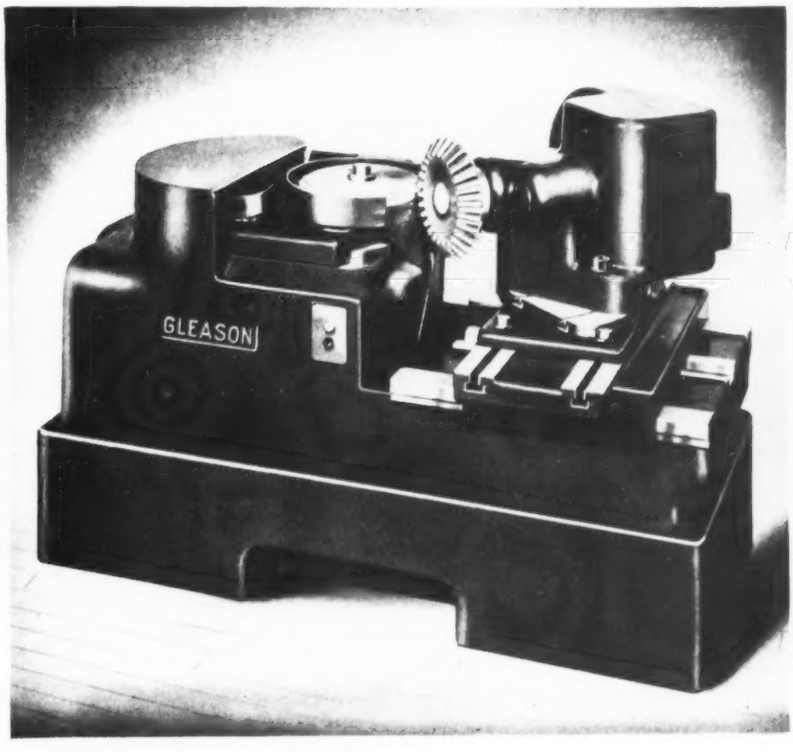
The outstanding advantage of this new type of machine is its ability to rough-cut gear teeth close to the required form with respect to the taper and the profile shape. Other important advantages are the high rate of production, and the ease with which the machine can be set up. The hydraulic chuck and hydraulic movement of the work-head add to the speed and convenience of operation, which consists simply of pushing the starting button and changing the work.

The proper taper and profile shape of the tooth-slots are obtained by the combined effect of the shape of the cutter-blades and a horizontal motion imparted to the cutter-spindle. The disk type cutter, which is 15 inches in diameter, with blades extending radially outward from the cutter body, is so mounted as to rotate in a horizontal plane. One cutter covers a limited range of gears and pinions. A single hydraulic control lever operates the work-head for changing blanks, including chucking, as well as the movement and clamping of the head. Indexing of the work-spindle is controlled by change-gears. Lubrication of the machine, except for the electric motors, is entirely automatic. The machine weighs approximately 9000 pounds, and requires a floor space of about 40 by 85 inches. 51

Electrode for Aircraft Welding Operations

The Lincoln Electric Co., Cleveland, Ohio, has developed a new electrode designed to speed up electric arc-welding operations in the fabrication of engine mounts, landing-gear forks, and other aircraft structural welding work. This electrode, known as "Planeweld," is of the shielded-arc type, and is adapted for welding the S A E 4130 and X-4130 chromium-molybdenum steels so widely used in airplane construction.

"Planeweld" is suitable for welding in all positions; and when used on steel of the types mentioned, provides weld metal with physical properties similar to the metal welded. It comes in two types—No. 1 for material 0.120 inch thick and heavier; and No. 2 for light-gage airplane parts up to about 7/64 inch thick, and for airplane tubing. It is available in four sizes—1/8 and 5/32 inch in the No. 1 material, and 1/16 and 3/32 inch in the No. 2 material. 52



Gleason Bevel-gear Rougher Developed to Produce Correctly Tapered Tooth-slots in Straight Bevel-gear Blanks

To obtain additional information on equipment described on this page, see lower part of page 154.

Hanchett Rotary Surface Grinder for Precision Operation on Aircraft-Engine Crankshafts

The Hanchett Mfg. Co., Big Rapids, Mich., recently developed the rotary surface grinder shown in Fig. 1 for use in the plant of one of the country's leading aircraft-engine manufacturers. This No. 36 machine is fitted with a special fixture which was also designed by the company. This fixture, shown in the close-up view, Fig. 2, is arranged to hold the crankshaft solidly, so that the base where the counterweights are to be attached can be ground square with the axis of the shaft to within 0.0004 inch.

The grinder is equipped with an 18-inch cylinder wheel, which has a special diamond dresser that can be used to form one corner of the grinding wheel to the required radius. The grinding wheel is driven by a 30-H.P. motor having a speed of 900 R.P.M. The rotary fixture table is mounted on the conventional type of carriage, and its position under the grinding wheel is controlled by the large handwheel at the front of the machine. This control permits very accurate positioning of the crankshaft for the grinding operation.

A handwheel at the back of the machine is provided for operating a micrometer screw stop which determines the correct grinding position for each succeeding crankshaft placed in the fixture. There is a 175-gallon coolant tank located in the bed of the machine, together with a motor-driven pump for circulating the coolant. The weight of the complete grinder is about 19,000 pounds. 53

Prosser Heavy-Duty Carbide Tool Grinder

Thomas Prosser & Son, 120 Wall St., New York City, have brought out a heavy-duty carbide tool grinder which embodies all the features of the smaller Model AA machine plus ample power for grinding the heaviest tools, together with provision for wet grinding. The machine is designed for the rapid removal of metal in roughing, and for the accurate finishing of all single-point tools to smooth, keen cutting edges, with the flat surfaces held to the desired angles. Special care has been taken to eliminate vibration, in order to make the machine well suited for the use of diamond wheels. At the same time, ample power is provided for operating the coarsest roughing wheels. High-speed steel and Stellite, as well as carbide tools, can be ground.

The wet grinding equipment provides a sufficient flow of water to keep the tools cool and permit faster grinding without danger of checking or cracking.

Heavy-duty Cemented-carbide Tool Grinder Brought out by Thomas Prosser & Son

Quick-acting indexing tables permit instant setting to the desired angle. The spindle runs in double-row, self-aligning, precision ball bearings, and is driven by double V-belts. A totally enclosed dustproof motor is supplied, with a drum type on, off, and reverse switch, so that roughing and finishing of both right- and left-hand tools can be easily accomplished with the wheels always rotating toward the cutting edge of the tools. 54

Fig. 1. Hanchett Rotary Surface Grinder Designed to Finish Counterweight Seats on Aircraft-engine Crankshafts

Fig. 2. Close-up View of Fixture and Work Shown in Fig. 1

To obtain additional information on equipment described on this page, see lower part of page 154.

Hardinge High-Speed Precision Second-Operation Machine

The high-speed, precision, second-operation machine here illustrated is a refinement of machines previously built by Hardinge Brothers, Inc., Elmira, N. Y., and is adapted for use wherever batteries of such machines are required in production departments, as well as in experimental or laboratory departments requiring only one or more machines. Some of the advantages of the new design are enclosed head with preloaded, ball-bearing spindle construction; electrical driving unit with multi-speed motor which eliminates all gears, clutches, and loose pulleys; lever speed control at the headstock; and a steel pedestal of all-welded construction.

The bed rests on three balls, which form a three-point suspension designed to guard against distortion from uneven floors. The rear of the spindle carries a double V-pulley for two endless V-belts from the driving unit. These belts can be applied or removed without disturbing the headstock spindle or bearings. The automatic collet-closer permits rapid opening and closing of the collets or step chucks with the spindle stopped or rotating. It can be adjusted so that any desired clamping pressure can be applied to the work.

The tool-blocks, as well as the tool-bit holders, are adjustable. Positive stops assure accurate cross-slide forming. Standard circular form tool-holders can be applied to the adjustable block in place of the regular tool-blocks. The tilted hexagon turret provides ample clearance for tools. The six-position turret head and stops are automatically indexed and locked in position by moving the operating lever.

A chart at the front of the machine shows the speeds obtainable. The eight forward and eight reverse speeds range from 230 to 3900 R.P.M. The welded-steel pedestal encloses the motor, driving unit, and coolant system. This machine has a 1-inch collet capacity, a 6-inch step chuck, and a swing of 9 inches. 55

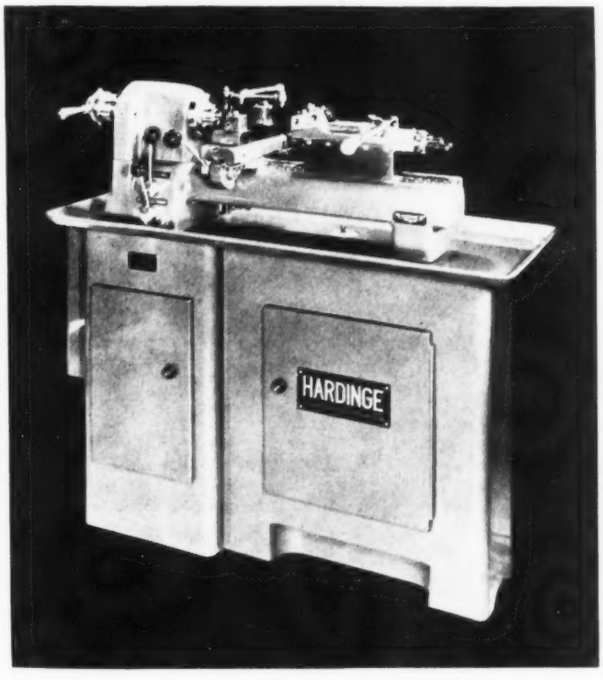
South Bend Tool-Room Precision Lathe

A tool-room precision lathe embodying a number of new features designed to save machining time has been brought out by the South Bend Lathe Works, 730 E. Madison St., South Bend, Ind. This Series S lathe has a 16-inch swing, and is made in three bed lengths with between-center capacities of 34, 46, and 58 inches. Stock up to 1 3/8 inches in diameter can be passed through the spindle, which takes collets up to 1-inch capacity.

The fully enclosed motor drive provides eight spindle speeds ranging from 21 to 725 R.P.M. The belt drive to the cone pulley and spindle assembly has been developed to give smooth vibration-free operation at high spindle speeds. Back-gears provide slow spindle speeds and ample power for machining large diameters. A belt-tension release lever and wrenchless bull-gear lock permit rapid changing of spindle speeds. The power feeds are controlled by a multiple-disk friction clutch, so constructed that it will not stick or slip under heavy cuts.

The full quick-change gear mechanism provides a series of forty-eight power longitudinal carriage feeds ranging from 0.0015 to 0.0841 inch, a series of forty-eight power cross-feeds from 0.006 to 0.0312 inch, and a series of forty-eight right- and left-hand screw-thread cutting feeds from 4 to 224 threads per inch. Large-diameter handwheels facilitate precision adjustments on close-tolerance work. Adjustable micrometer collars on the cross-feed screw and the compound-rest screw are large in diameter with clear-cut, easy-to-read graduations.

Tool-room attachments supplied with the lathe include handwheel type draw-in collet chuck, telescopic



Hardinge High-speed Precision Second-operation Machine

South Bend Precision Tool-room Lathe with 16-inch Swing

To obtain additional information on equipment described on this page, see lower part of page 154.

taper attachment, micrometer carriage stop, thread dial indicator, and chip pan. An electric grinding attachment, milling attachment, and other attachments, chucks and accessories can be supplied to order. 56

Material for Removing Buffing Compounds

The Quaker Chemical Products Corporation, Conshohocken, Pa., is offering to the trade a new material for removing buffing compounds, grease, and similar foreign matter from all metals. This product, known as Quasol No. 11, can be used with most mineral solvents to form a clear liquid of extreme penetrating and emulsifying properties. A mixture of one part Quasol No. 11 and seven to twelve parts of kerosene or similar solvent can be employed.

The solvent mixture is applied in a spray washing machine or tank. The work to be cleaned is subjected to the solvent for from one to three minutes, depending on the strength of the solution, after which it is rinsed, ready for the electro-cleaning process preparatory to plating or other finishing operations. 57

Atlas Bench Milling Machine

The Atlas Press Co., 1153 North Pitcher St., Kalamazoo, Mich., has brought out a new milling machine which is available with any of the following types of table feed: Standard screw feed; lever "rapid" feed; and "Change-O-Matic" power feed. The table is 4 1/2 by 18 inches. The longitudinal table travel by hand feed is 12 inches, and with the "Change-O-Matic" 10 inches. The feed range with the "Change-O-Matic" is from 0.162 to 9.125 inches per minute. The table has a cross travel of 3 1/4 inches and a vertical travel of 6 inches.

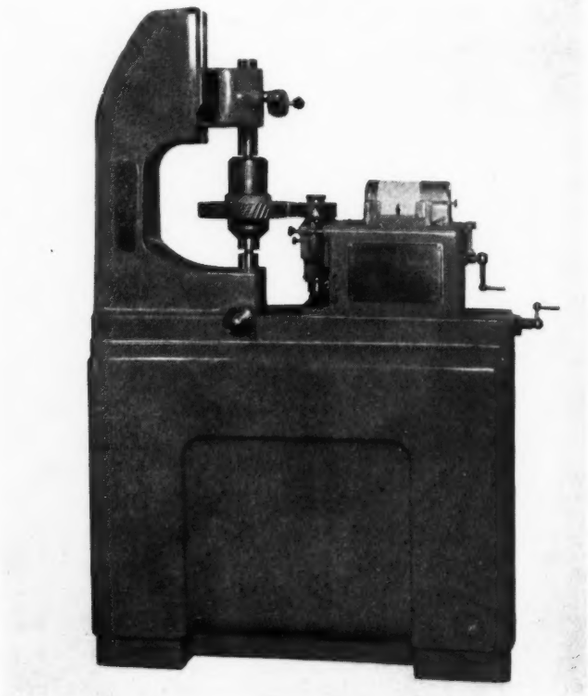
The spindle has twelve speeds ranging from 54 to 3225 R.P.M., and is made with a No. 2 Morse taper. The hole through the spindle is 17/32 inch in diameter, the arbor is 7/8 inch in diameter, and the overarm is 1 1/2 inches in diameter. The over-all dimensions of the machine are 25 1/2 by 32 1/2 by 22 inches, the base dimensions being 20 1/2 by 18 1/2 inches. It is recommended that a 1/3-H.P., 1740-R.P.M. motor be used to drive this machine. The weight of the machine with "Change-O-Matic" feed, but without the motor, is 200 pounds. 58

Fellows "Red Liner" for Checking Gears

The Fellows Gear Shaper Co., 78 River St., Springfield, Vt., has recently placed on the market a machine for checking gears, especially airplane engine gears and similar classes of gears requiring very accurate inspection. This machine, known as the No. 20M Red Liner, will handle spur or helical gears with pitch diameters up to 18 inches. It operates on the same fundamental principle as the regular Red Liner, in which a red line traced on a constantly moving chart records inaccuracies in pitch, pressure angle, etc., when two gears are rotated in mesh. The new machine, however, is arranged to handle gears on centers which are adjustable. The lower center can be adjusted to present the gear in the correct relationship to the master gear, and the upper center is arranged for handling gears or arbors of different lengths.

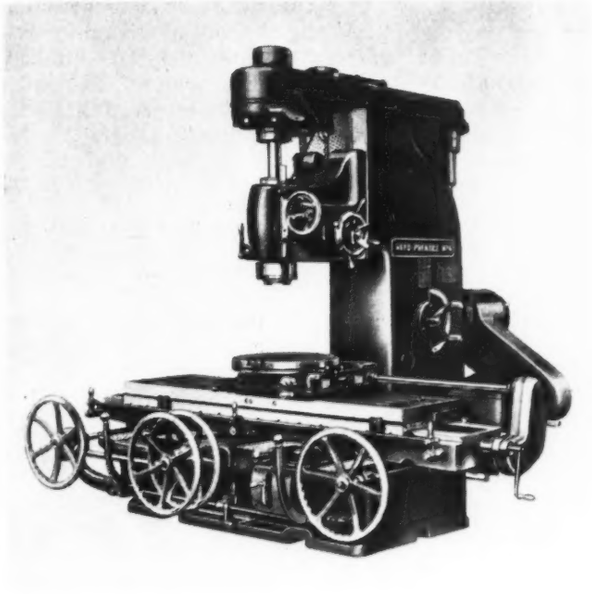
This machine can also be arranged for checking internal gears. It is equipped with a 1/20-H.P. motor capable of operating on alternating or direct current, and can be conveniently operated from a regular light socket. The machine can also be operated by hand. The chart mechanism is similar to that employed on the regular Red Liner. 59

Bench Milling Machine Placed on the Market by the Atlas Press Co.

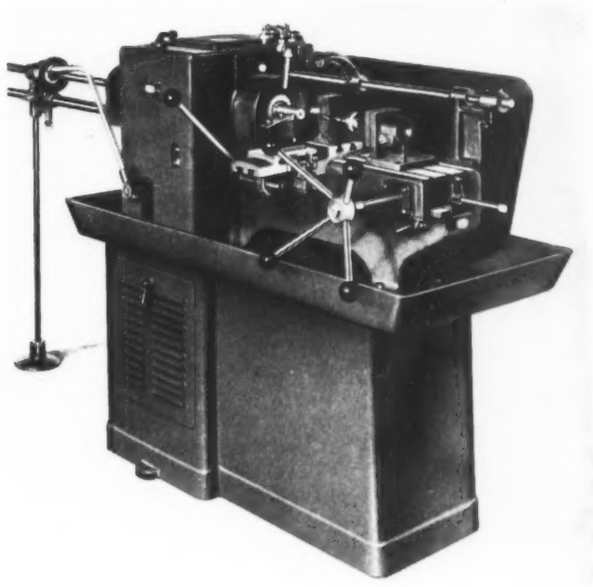


"Red Liner" Gear Checking Machine Built by Fellows Gear Shaper Co.

To obtain additional information on equipment described on this page, see lower part of page 154.



Reed-Prentice Vertical Milling and Die-sinking Machine



"Rapiduction" Lathe Developed by the Oster Mfg. Co.

Reed-Prentice Vertical Milling Machine with Gear-Driven Spindle

The Reed-Prentice Corporation, of Worcester, Mass., has recently brought out a No. 6 vertical milling and die-sinking machine which has a positive gear drive to the spindle. This machine is adapted for handling large dies and for general milling work. The top box containing the gear drive is totally enclosed and dustproof. A V-belt drive with five belts transmits power to the machine from the motor; a motor of 10 H.P. operating at 1200 R.P.M. is recommended. The main drive pulley is provided with clutch and brake for starting and stopping, and is controlled by two levers at the front of the machine table. The head is provided with double back-gearing, the bevel-gear shafts and spindle being mounted in Timken roller bearings.

The main table, with a working surface of 72 by 20 inches, has a longitudinal power feed of 72 inches and a cross power feed of 24 inches. The travel of the head on the column is 18 1/2 inches, and the vertical feed of the spindle, 11 1/2 inches. The maximum distance from the end of the spindle to the table is 33 inches, and the maximum distance from the end of the spindle to the auxiliary rotary table is 25 1/2 inches. The throat depth is 28 1/2 inches, and the distance from the spindle center to the column face is 18 inches.

The rotary table has a working surface 24 inches in diameter. There are twelve spindle speeds ranging from 15 to 500 R.P.M., and there are eight feeds for each spindle speed, ranging from 0.002 to 0.280 inch. The machine weighs 18,500 pounds, and occupies a floor space of 156 by 115 inches. 60

New Aluminum Oxide Polishing Grain

"Vanite," a fused aluminum oxide produced in the electric furnace, is the trade name given to a new polishing grain placed on the market by the Hanson-Van Winkle-Munning Co., Matawan, N. J. This polishing grain is a product of bauxite from which the impurities, such as titanium oxide, iron oxide, and silica have been removed. The grains are of the "blocky" type, as nearly equidimensional as possible, and practically free from weak particles like flats and slivers.

The grain is closely controlled by screening and separation into over size, normal, and under size groups, and each keg of Vanite is subjected to a screen analysis to determine the percentages of these three sizes.

High capillarity or "degree of wetting" is one of the important properties of these abrasive grains when used with adhesives such as glue. The available sizes of Vanite polishing grain, listed from coarse to fine, range from 4 to 6 up to 240 and FFF. 61

Oster "Rapiduction" Lathe

A new "Rapiduction" lathe adapted for cutting off, boring, tapping, reaming, facing, threading, and various other operations has just been placed on the market by the Oster Mfg. Co., 2057 E. 61st Place, Cleveland, Ohio. This lathe has a capacity for handling round stock up to 1 1/2 inches in diameter. It is designed primarily as a low-cost manufacturing lathe for simple turning operations, and does not require highly skilled labor for efficient operation.

The spindle and worm-shaft run in oil in the totally enclosed head. The ball-bearing spindle is built with an American Standard flanged type nose. Multiple V-belts from the motor to the worm-shaft provide drive speed changes obtainable through quick-change sheaves which give spindle speeds from 140 to 1000 R.P.M. The coolant pump in the base is driven by a V-belt from the motor. The toolpost is longitudinally adjustable for the length of the carriage.

A variety of chucking equipment is obtainable, including a faceplate. Either a manually operated or an automatic stock stop can be provided. Power is furnished by a 2-H.P., two-speed, induction motor, with reverse or electric braking features optional. The machine has a swing of 13 inches over the bed and 6 inches over the cross-slide. It occupies a floor space of 33 by 70 inches without the bar-feed, which extends 94 inches beyond the machine pan. 62

To obtain additional information on equipment described on this page, see lower part of page 154.

"Ultra-Lap" Machine Designed to Finish Flat Surfaces

"Ultra-Lap" Machine for Producing Flat Surfaces of Extreme Accuracy

The "Ultra-Lap" principle of surface finishing, which has been employed so successfully in the refrigeration industry, for which it was originally developed, can now be applied to a large variety of products that must be made optically flat and smooth to very low micro-inch specifications. The new Ultra-Lap machine, brought out by the Ultra Lap Machine Co., 247 McDougall Ave., Detroit, Mich., makes it possible to finish any number of surfaces with almost identical characteristics of flatness and smoothness on a production basis.

With this machine, the multiplicity of motions, the light pressures involved, and the type and quantity of abrasive used enable any material or combination of materials to be lapped without danger of loading or impregnating the finished surface with abrasive material. Samples of various materials, such as steel, cast iron, leaded bronze, aluminum, copper, die-cast alloys, etc., have been tested under polarized light, after being finished on the Ultra-Lap machine, without revealing any trace of abrasive in the finished surfaces.

Specifications set to the closest of tolerances for optical flatness and surface smoothness can be met on a production basis by Ultra-Lap machines. These machines are now operating in plants where limits of under one light band (0.000012 inch) for flatness and of one or two microinches for smoothness are specified. The machine is easy to operate, and is constructed to stand up under continuous use. It reproduces mechanically the motion generally used in hand-lapping, and thus produces a finish without concentric lapping marks or lapping marks that all run in the same direction. The lapping plates stand up well, and can be easily reconditioned. 63

Equipment for Finishing Carboloy Drawing Dies

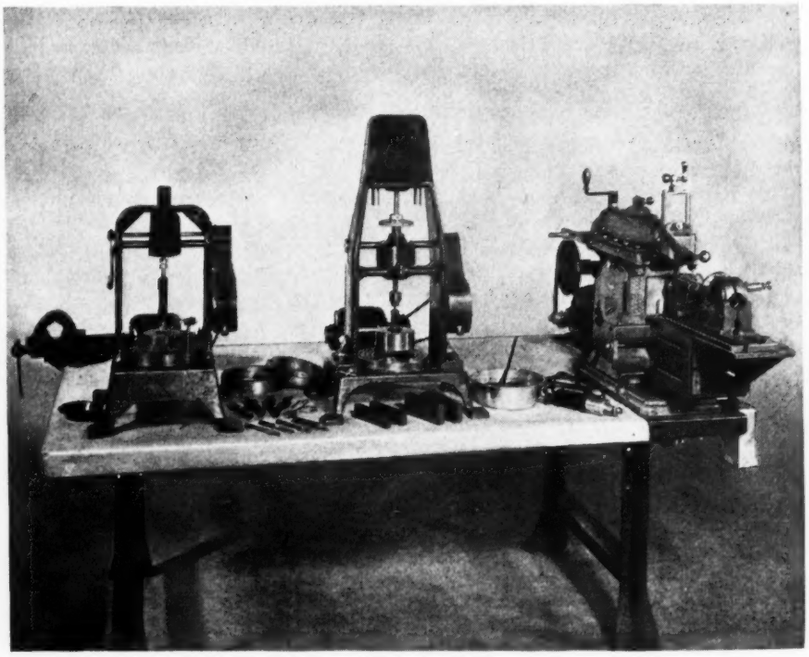
A complete line of equipment for finishing and servicing Carboloy drawing dies used in producing bars and rods of special shapes—such as hexagonal, square, rectangular, half-round, etc.—has been developed by the Carboloy Company, Inc., 11147 E. 8 Mile Road, Detroit, Mich. This finishing equipment consists essentially of a die-bearing sizing machine, a die-shaping machine, a hand-polishing tool, and an adaptation of a bench shaper for machining the required laps.

The Carboloy Company is also placing on the market shape-drawing dies in the low-priced cored or preformed state which can be quickly finished to the shape desired by the purchaser through the use of the new finishing equipment. The line of dies comprises standard hexagonal and square rough-cored types which are available in a wide range of sizes. These dies are so designed that they require a minimum of stock removal to fit them for drawing rods of the usual sizes, the cored shapes being identical to the usual forms of drawing dies, with a 16-degree approach angle and a 30-degree back-relief angle.

All three of the simple machines designed for working the dies have the same basic action — namely, a short high-speed reciprocating stroke. In all cases, an electric motor drive actuates an eccentric which, in turn, imparts a reciprocating motion to the vertical spindle. It is recommended that laps of mild steel be used with this equipment in combination with various grades of boron carbide or diamond powder as lapping compounds for roughing and finishing the dies. 64

"Ampco-Weld" Aluminum-Bronze Coated "Weldrod"

Ampco Metal, Inc., 1745 S. 38th St., Milwaukee, Wis., has brought out an aluminum-bronze coated



Equipment for Finishing Carboloy Drawing Dies Developed by the Carboloy Company, Inc.

To obtain additional information on equipment described on this page, see lower part of page 154.

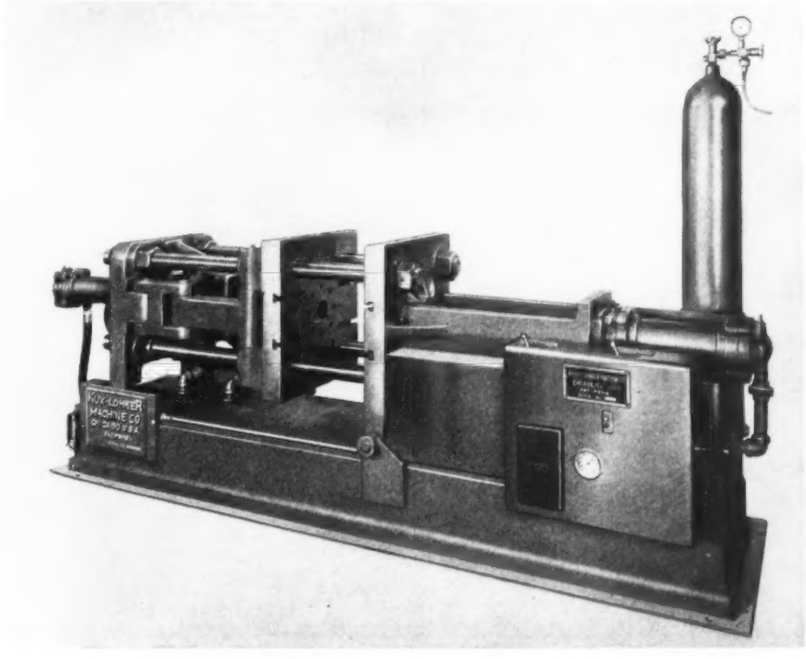
"weldrod," which has been developed to obtain wear resistance, high strength, hardness, and resistance to fatigue and corrosion. The rod is made in various grades with tensile strengths ranging from 39,600 to 96,000 pounds per square inch and in a wide range of hardnesses. The elongation in 2 inches ranges from 0.5 to 31 per cent. 65

Kux-Lohner High-Pressure Aluminum or Brass Die-Casting Machine

The new high-pressure type die-casting machines designed by the Kux-Lohner Machine Co., 2147 Lexington St., Chicago, Ill., will produce die-castings from either aluminum or brass alloys. These machines, built in two sizes—HP-12 and HP-18 are of the hand-ladling type, in which the molten metal is ladled by hand from a crucible into a well at the back of the stationary die half and from there injected into the die under pressures up to 10,000 pounds per square inch. The space between the bars is 12 inches square on the smaller machine, and 18 inches square on the larger machine. Castings up to 7 pounds in brass and 2 1/2 pounds in aluminum can be produced on these machines.

The dies are opened and closed by a powerful toggle arrangement. The toggle bearings on the die-plates are extremely wide and extend to all four corners of the plates. Hardened-steel pins of ample size to withstand the high locking pressures operate in hardened-steel bushings. The machines are furnished for full-automatic operation, with the rams for opening and closing the dies and injecting the metal all operated from a central motor-driven hydraulic pump unit mounted on an oil storage tank. Only one operator is required for a machine. Both sizes of machines are built close to the floor to facilitate the hand-ladling of the metal.

Safety features are provided which insure operating each phase of the casting cycle in the proper sequence, so that each cycle is completed before the next one can be started. An electric timing device controls the solidifying period. 66



Die-casting Machine for Aluminum and Brass Alloys Designed by the Kux-Lohner Machine Co.

Wardwell Saw Grinder

The Wardwell Mfg. Co., 3167 Fulton Road, Cleveland, Ohio, has brought out a grinder designed for automatically sharpening form milling cutters and metal-cutting saws, in gangs, from 2 to 8 inches in diameter and up to 3 3/4 inches thick, with tooth spaces up to 1 1/4 inches from point to point.

Wardwell Grinder Designed for Sharpening Circular Saws

This machine—the No. 57T—automatically indexes a gang of saws, one row at a time. The grinding wheel is shaped to suit the gullet of the tooth. The machine will sharpen a gang of saws to size within a variation of plus or minus 0.001 inch of the exact diameter for the entire lot. A group of 250 saws, 0.015 inch thick, can be sharpened at one time. A diamond dresser mounted on the wheel guard can be furnished to special order. The machine can be arranged for either belt or motor drive. It is also made with or without the pedestal. A coolant pump is furnished with the pedestal type only. The pedestal type belt driven machine weighs 525 pounds. 67

GS Machinists' Tools

The George Scherr Co., Inc., 128 Lafayette St., New York City, has just brought out its own line of GS machinists' tools. The line consists of a machinists' combination set with drop-forged hardened square heads, hardened center head, and hardened blade and reversible protractor head; a machinists' combination set with hardened blade, and cast-iron center head, protractor, and square head; 4-, 6-, and 8-inch dividers; 4-, 6-, and 8-inch inside and outside spring calipers; hardened and tempered center gages; thickness, depth, and surface gages; and magnifiers. Hook, sliding caliper, flexible, and narrow tempered rules are also included in this line. 68

To obtain additional information on equipment described on this page, see lower part of page 154.

Dayton Rogers Universal Pneumatic Die Cushion

Vibration Frequency Meter Made by Westinghouse Electric & Mfg. Co.

Dayton Rogers Universal Pneumatic Die Cushion

The Dayton Rogers Mfg. Co., 2830 S. 13th Ave., Minneapolis, Minn., is placing on the market a Model D improved, universal, pneumatic die cushion. These improved die cushions are now made in seven sizes, ranging from 6 to 14 inches, having capacities for deep drawing work from 2 to 8 inches, and can be used with or without storage tank reservoirs.

Each cushion has a combination reducing control valve and pressure gage. The die cushion can be mounted directly on the bottom side of the bolster plate for all draw-ring and pressure-pad control operations or it can be spaced at a distance from the bolster plate to allow blanks or slugs to pass through the bolster plate. The correct height of the pin pressure-pad is predetermined and is maintained by the handwheel. This adjustable feature permits compensation for bolster-plate thickness variation, sharpening and grinding of dies, and change in die design. The cylinder section is so designed that it automatically shields the cushion proper, preventing pierced slugs or loose parts from coming in contact with the cushion unit. 69

Small Size, Sensitive, Vibration Frequency Meter

A new vibration frequency meter weighing only 8 ounces and designed to aid the engineer in determining the causes and in finding the cures for machine vibrations is being introduced to the trade by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The new instrument is no larger than an engineer's slide-rule, but it indicates frequencies between 500 and 20,000 cycles per minute in a vibrating body.

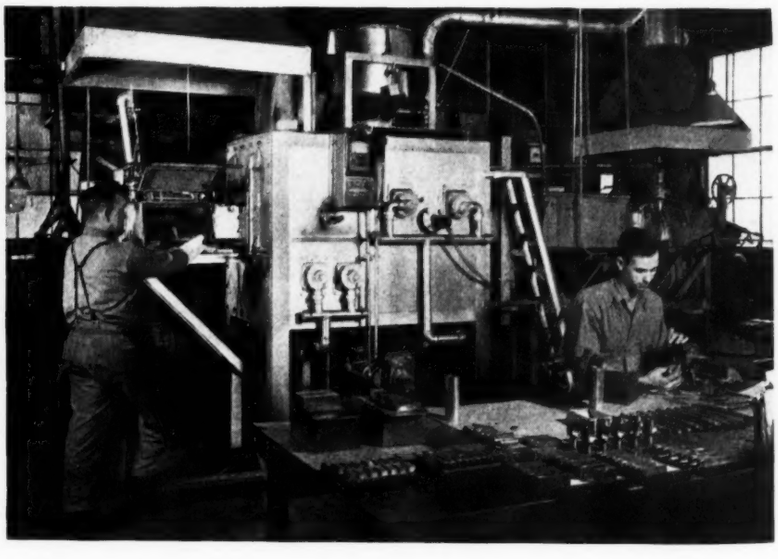
This compact device is built around the principle of the vibrating reed, and consists of a thin spring steel vibrator clamped at one end between a set of steel rollers. A knurled knob connected to the rollers permits their rotation and moves the steel reed in or out, changing its frequency of vibration. A sliding pointer on the back end of the steel reed indicates the vibrating frequency, which is read off the calibrated scale on the frame of the instrument.

In using the meter, its head is held against the vibrating body and the adjusting knob rotated until the vibrator moves to and fro at maximum amplitude. If more than one vibrating frequency exists, there will be a point of maximum amplitude for each, and vibrations in different planes can be detected by changing the axis of the meter. It will indicate a vibration whose double amplitude is 0.0001 inch or greater. Although not designed specifically for measuring the amount of vibration, it can be used as a rough indicator of vibration magnitude. 70

Carbide-Tool Brazing Furnace Employing Char-Mo Atmosphere

A semi-continuous furnace for brazing cemented-carbide tool tips to their shanks has been brought out by the Surface Combustion Corporation, Toledo, Ohio, for installation in the plant of the Morse Tool Co., Detroit, Mich. This furnace employs a new type of inexpensive atmosphere known as "Char-Mo," which is produced from charcoal in a self-contained generator, and was originally developed for heat-treating high-carbon and alloy steels without causing scale or decarburization. The atmosphere is composed of approximately two-thirds nitrogen and one-third carbon monoxide with infinitesimal parts of water vapor and carbon dioxide. The generator, which forms part of the furnace, requires no separate heating. The furnace proper is gas-fired.

The tools to be brazed are placed



Carbide-tool Brazing Furnace Brought out by Surface Combustion Corporation, and Bench for Wiring Carbide Tip and Copper to Tool Shank

To obtain additional information on equipment described on this page, see lower part of page 154.

on open trays and pushed manually through the furnace. Loading and unloading take place through side doors. The furnace produces, on an average, 2000 pieces in sixteen hours. The operating cycle is one and a half hours, consisting of fifteen minutes per heat, five minutes for brazing, and seventy minutes for cooling. 71

Improved Carbo-Lathe

W. C. Lipe, Inc., Syracuse, N. Y., has brought out an improved model Carbo-Lathe designed for high-production turning with modern alloy tools. Improvements developed to increase the rigidity and the ability to take heavy precise cuts in tough material at high speed without chatter or tool breakage have been incorporated in the new machine. The box-section base completely encloses the motor and drive mechanism. The motor cabinet has been made considerably larger to accommodate an alternating-current motor developing up to 10 H.P. The cabinet also provides additional space for free air circulation and efficient motor ventilation.

The base houses a large size chip pan and a coolant tank double the capacity used in previous models. Recessed toe-room is provided of sufficient height to prevent interference, even when the operator stands on a platform. A compartment at the end of the base provides room for storing tools and accessories. This Carbo-Lathe has a swing capacity of 12 inches, and will take work 18 inches between centers. Power from the motor is applied through a worm drive. The headstock and bed are cast in one piece of chromium-nickel iron weighing 600 pounds. A correspondingly heavy tailstock of two-piece construction is used. The tailstock is 3 inches in diameter, and its center can be operated by a handwheel or lever. 72

Greenerd Arbor Presses

The Greenerd Arbor Press Co., Nashua, N. H., is bringing out two new 30-ton hydraulic arbor presses designated No. H-70. The self-contained push type press, shown in Fig. 1, will exert any desired pressure from 6 to 30 tons on the down stroke. The 10-H.P. motor and pump are mounted on opposite sides of the main housing, and are directly connected.

The table is 18 inches wide, 15 inches deep, has a 3 1/2 inch cored hole that is centrally located under the ram, and a working surface approximately 34 1/2 inches from the floor. This table will accommodate work 22 inches in diameter.

The height over the working table is 14 inches, and the stroke of the ram 10 inches. The rapid traverse speed of the ram up to 15 tons pressure is at the rate of 138 inches per minute, with instantaneous changeover to a work speed of 38 inches per minute within the range of 15 to 30 tons pressure.

The 30-ton pull type machine, shown in Fig. 2, is designed for assembly jobs requiring a pulling rather than a pushing operation.

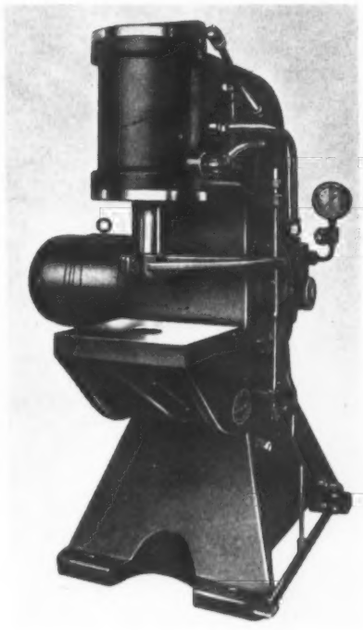
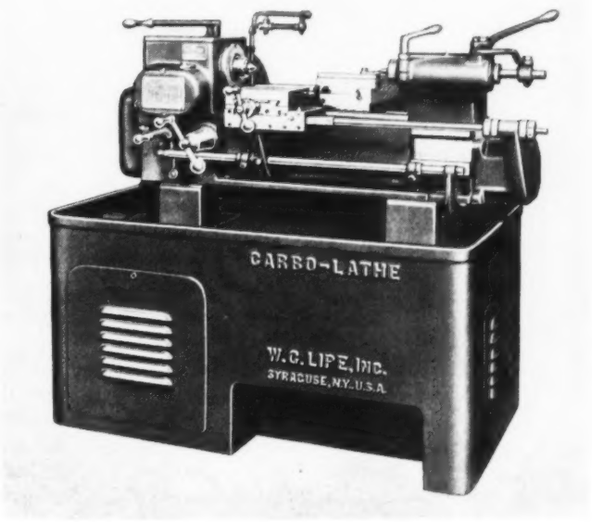


Fig. 1. Greenerd 30-ton Hydraulic Arbor Press

This press exerts a maximum pressure of 30 tons. It has a table diameter of 24 inches and a 2 7/16-inch diameter ram provided with a drift-pin slot near the upper end. The minimum height of the ram above the table is 5 1/2 inches, and the maximum height 22 1/2 inches. The ram is controlled by two handles. Releasing either one of the handles serves to stop the press. The rapid traverse speed of the ram is 138 inches per minute, and the working speed at 15 to 30 tons pressure is 38 inches per minute. 73



Improved Model Carbo-Lathe Brought out by W. C. Lipe, Inc.

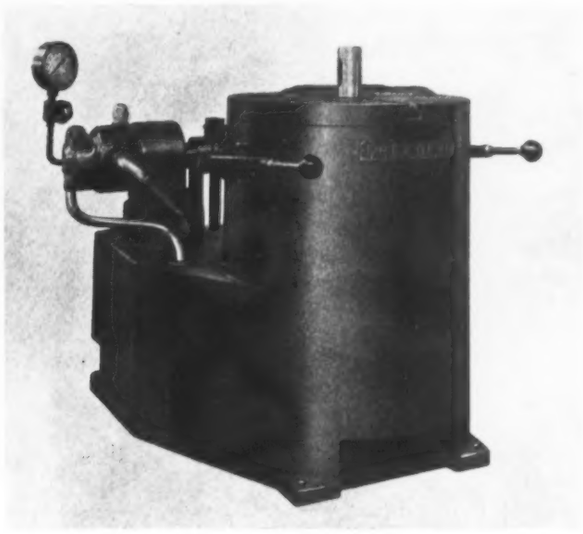


Fig. 2. Pull Type Arbor Press Built by Greenerd Arbor Press Co.

To obtain additional information on equipment described on this page, see lower part of page 154.

"Adjusto-Tray" and Power Screwdriver Equipped with "Pix-Up" Finder

Equipment for High-Speed Screwdriving

The Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill., has developed a new method of handling screws on power assembly work which is claimed to increase the speed of this operation from three to nine times. The equipment for applying the new method is especially adapted for use in assembling such products as clocks, time control mechanisms, refrigerators, radios, heating and air-conditioning units, automotive and aircraft accessories, and cameras.

The new equipment, consisting of the Thor "Pix-Up" finder and "Adjusto-Tray," provides efficient means for sorting, picking up, and holding the screws for driving with a power screwdriver. The "Adjusto-Tray" is a novel arrangement for holding the screws, which is spring-mounted on a base and can be adjusted by clamp screws at each of the four corners to accommodate the particular length of screw to be driven. The tray is of sheet steel, with flanged sides and ends, and has a series of longitudinal slots in it. A number of screws are turned into the tray, which, on shaking, causes the screws to be suspended in the slots by their heads, as shown in the illustration. With the screws in this position, a power screwdriver equipped with the "Pix-Up" finder is placed over a screw-head and pressed down. As the tray is depressed slightly against the springs at each corner, the finder grips the screw-head firmly in accurate alignment, holding it ready for the driving operation. The "Pix-Up" finder is of an extension type, and can be fitted to any Thor power screwdriver. 74

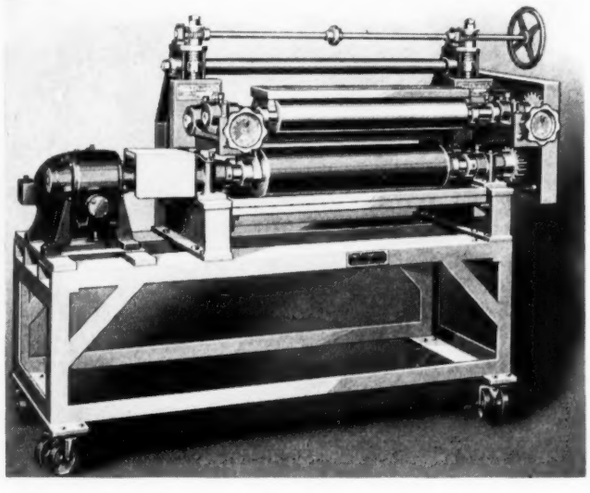
National Abrasives

The National Metal Abrasive Co., 3560 Norton Road, Cleveland, Ohio, has developed a method for controlling the production of steel-shot and grit abrasives, so that each size is given the correct degree of toughness and hardness. It is claimed that greatly improved results are obtainable when the degree of hardness and toughness of the abrasives is controlled by this process. 75

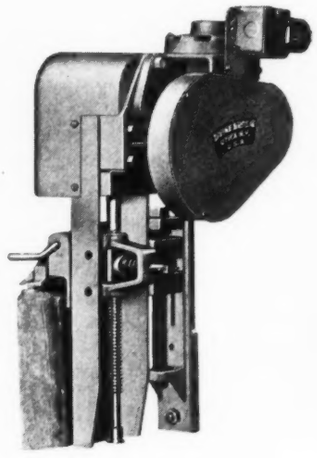
Divine Automatic Buffing Composition Applicator

Divine Brothers Co., Inc., Utica, N. Y., have recently placed on the market a composition applicator designed to automatically apply compound to the face of buffing wheels in an exact controlled amount and frequency. This applicator can be used in conjunction with lathes for hand-buffing, as well as on all types of automatic buffing machines.

The applicator is made in two sizes—the AK-4 and the AK-8—which have wheel-face coverage capacities of 4 to 5 inches and 8 to 8 1/2 inches, respectively. The applicators will take composition bars in sizes up to 2 1/2 inches thick by 10 inches long.



Machine Built by Charles E. Francis Co., for Coating Metal with Drawing Compound



Applicator Developed for Automatically Feeding Composition to Buffing Wheels

A 1/20-H.P. motor serves to operate the applicator at a speed of eight strokes per minute. The feeding stroke for applying the composition is adjustable to 0.002, 0.004, 0.006, and 0.008 inch. The attachment is 21 1/2 inches high, 10 3/4 inches wide, 9 inches deep, and weighs approximately 50 pounds. 76

Machine for Applying Drawing Lubricant to Steel Sheets

The Charles E. Francis Co., Rushville, Ind., has placed on the market a new coating machine for applying drawing compound to steel sheets preparatory to shaping or forming operations. The machine consists of two corrugated-rubber coating rolls which apply the coating to both sides of the sheet. A "Doctor," or scraper roll, is used in conjunction with each coating roll to govern the thickness of the coating and also to form a pocket for holding the compound. If desired, the lower coating roll can be adjusted to pick up its supply and mixture from a stationary or adjustable pan. Calibrated adjustments are used for governing the spread, as well as for adjusting the opening between the rolls.

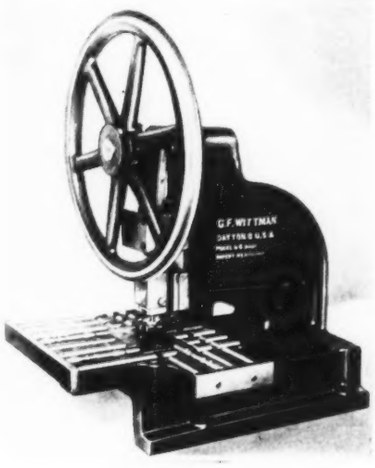
To obtain additional information on equipment described on this page, see lower part of page 154.

The machine can be furnished mounted on a welded steel stand with casters, as illustrated. It can be obtained in any width, in regular or extra heavy construction, in a bench or floor model, and arranged for single or double coating. 77

Wittman Spacing and Punching Machine

A hand-operated machine designed for quickly and accurately laying out and punching holes of round, square, or other shapes is being manufactured by G. F. Wittman, 20 Northwood Ave., Dayton, Ohio. This machine is recommended especially for experimental work and for short-run production jobs. With this equipment, the accuracy of the spacing can be held to within 0.0005 inch. The standard micrometer-controlled spacing plate will accommodate a piece of work 4 inches wide by 6 inches long by squaring two sides; and 8 by 12 inches by squaring four sides. It will punch holes up to 5/8 inch in diameter in material 1/8 inch thick.

For short-run production lots, follow-up presses are recommended. The follow-up presses are of the same construction as the spacing machine, except that the spacing plate is removed and a different type stripper employed. The punch is operated by a 20-inch handwheel, and has a capacity of 15,000 pounds. The throat is 8 inches deep. The punch has a stroke of 1/2 inch, and the punch ram has an adjustment of 3/4 inch. The punch requires a bench space 14 inches wide by 18 inches deep. The shipping weight is about 370 pounds. 78



Spacing and Punching Machine
Made by G. F. Wittman

Brown "Protectoglo" Photo-electrode

Photo-Electrode System for Preventing Failure of Fuel Systems

The Brown Instrument Co., Division of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa., has developed a method of control intended to insure protection against failure of oil, powdered coal, and luminous gas flames. The control makes use of the recently developed Brown "Protectoglo" photo-electrode system. This system, operating on the photo-electric principle, is arranged to eliminate the necessity for placing a metal electrode in the high-temperature flames, and at the same time, permits the equipment to retain the desired quick-response feature.

The operation of the photo-electrode is similar to that of the Brown flame-electrode "Protectoglo" system, the principal difference being in the method of flame detection. Instead of using a metallic electrode, the "Protectoglo" photo-electrode system detects the presence of a flame by means of the light emitted when a burner is in normal operation. In operation, the light from the flame is directed upon a photocell. This results in a small flow of current through the cell, which is amplified by a vacuum-tube circuit until of sufficient magnitude to close a relay which actuates the main fuel valve.

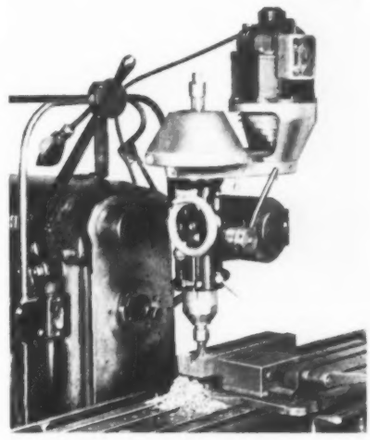
The response of the system to flames of different luminosity may be changed by means of a sensitivity adjustment. With this adjustment in the maximum position, the unit will easily respond to the light of a candle, while in the minimum position, no amount of light will close the relay. A time lag in the relay prevents transient flame disturbances from causing shut-downs. 79

Rusnok High-Speed Motor-Driven Milling, Drilling and Boring Attachment

The new Rusnok milling, drilling, and boring attachment manufactured by the Rusnok Tool Works, and distributed by Lockwin & Co., 205 W. Wacker Drive, Chicago, Ill., embodies in its construction the principles of design that have proved successful in the rigid-spindle model milling attachment built by the company.

The added advantage of quill travel greatly widens the scope and variety of cutting operations that can be performed with this attachment. A large size hardened and ground quill, lapped to a precision fit, has a full 4-inch sliding travel in the spindle housing. Coarse and fine hand feeds are provided for the quill travel, and the worm-feed can be engaged or disengaged with the quill in any position.

A locking type micrometer depth stop and a positive-acting quill lock are provided. The spindle has a six-way spline, is bored for a No. 9 B&S taper, and runs in Timken roller bearings. It can be equipped with interchangeable 3/8-, 1/2-, or 5/8-inch end-mill holders to accommodate all sizes of standard straight-shank end-mills from 1/16 to 1 inch. A 1/2-H.P. motor, protected by a thermostatic switch, is mounted separately from the operating unit. The six speeds determined as being most useful for normal shop practice range from the low speeds of 250 and 400 R.P.M. up to 3000 R.P.M. 80



Motor-driven Attachment for Milling, Drilling, and Boring

To obtain additional information on equipment described on this page, see lower part of page 154.

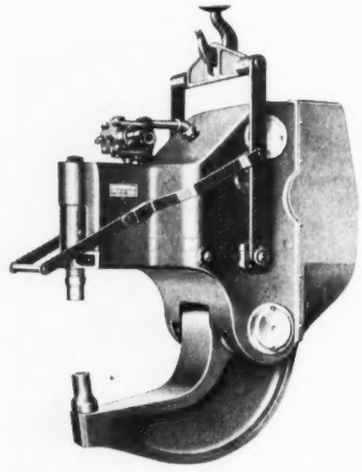
Cutler-Hammer Limit Stop for Crane

Crane Limit Stop

Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis., has placed on the market a new type main-circuit crane safety limit stop designed to prevent over-travel of the crane hook when hoisting. The new device operates by means of a counterweight lever and a suspended reset weight. As the crane hook approaches its limit of travel, the reset weight is raised, thus allowing the counterweight to trip the switch and disconnect the motor from the line. 81

Hanna Heavy-Duty Pneumatic Riveter

The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., has recently developed a heavy-duty pinch-bug type pneumatic riveter to meet the demand for a riveter having sufficient capacity to handle structural rivets from 1 1/8 to 1 3/8 inches in diameter. The rivets are inserted from above and driven from below to obtain the utmost speed.



Hanna Pneumatic Riveter Built for Heading Rivets from 1 1/8 to 1 3/8 Inches in Diameter

The mechanism of this riveter is entirely enclosed. A hardened and ground alloy steel wedge transmits the power of the cylindrical piston unit to the hardened and ground rollers mounted in the driving jaw. The driving jaw closes on the rivet and exerts a uniform predetermined pressure on the dies, even though the variation in length of the rivet and grip may be as much as 1/2 inch.

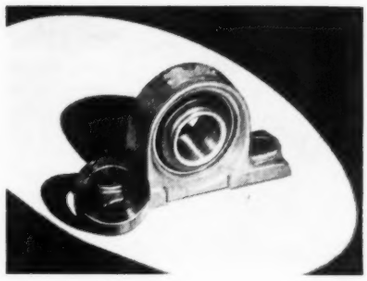
The riveter illustrated exerts 80 tons pressure on the dies when operated at an air pressure of 100 pounds per square inch. The die stroke is 4 inches; the reach 22 inches; and the gap 20 inches. The gap, however, can be varied by the use of interchangeable jaws. 82

"SealMaster" Ball Bearing with Extended Inner Ring

"SealMaster" Extended Inner-Ring Bearings

The Bearing Division of the Stephens-Adamson Mfg. Co., Aurora, Ill., has recently added to its line of "SealMaster" ball bearings a Style A extended inner-ring bearing made in fractional-inch dimension bores for shafts from 5/8 to 2 15/16 inches in diameter. These bearings are designed for machine applications on straight shafts. They have the patented "SealMaster" centrifugal labyrinth seal designed to keep out dirt and retain lubricant. This bearing requires no seals in the housing.

An annular groove with two holes in the outer race permits regreasing. Prelubrication and the ability of the bearing to retain lubricant are features that tend to reduce maintenance to a minimum. The bearing is fitted with a locating snap ring which permits a through bore in the housing. Bearings of this line can be easily and securely locked on the shaft with either knurled cup-point set-screws or one-half dog-point set-screws with locking wire. 83



Fafnir Transmission Unit with "Mechani-Seal" Ball Bearing

Fafnir Sealed Transmission Units

The Fafnir Bearing Co., New Britain, Conn., is placing on the market a new series of ball-bearing pillow blocks and other transmission units that have been especially designed to facilitate installation. The recently developed Fafnir "Mechani-Seal" ball bearings are incorporated in these new units. The new light series pillow blocks, flange cartridges, and cylindrical cartridges in this line thus offer the advantages of the "Mechani-Seal" construction combined with the easy installation features made possible by the Fafnir wide inner-ring design with self-locking collar. No shaft shoulders, adapters, or lock-nuts are required for the installation of these units, and no machining operations are necessary. 84

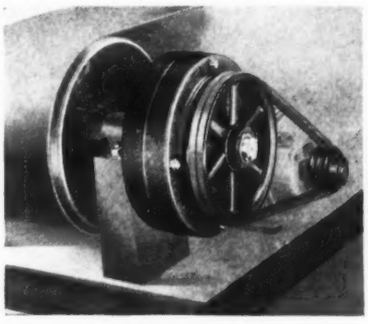
American Reduction Drive

An entirely new type of speed reducer has been introduced to the trade by the American Pulley Co., Philadelphia, Pa. This new equipment consists of two major elements —a helical-gear reduction unit, which is mounted directly on the shaft of the driven machine, and a standard belt drive between the motor and the input shaft of the reduction unit.

The unit itself has a standard fixed ratio of 13 to 1, any larger or smaller ratios being obtained by the primary belt drive. For example, where an over-all reduction ratio of 52 to 1 is desired, a belt drive is selected with a ratio of 4 to 1. This ratio, in combination with the ratio of the reduction unit, gives the speed required.

Five reduction units, each with the same 13 to 1 ratio, cover all applications from 1/20 to 30 H.P.; thus any desired speed between 11 and 215 R.P.M. can be obtained with standard equipment which can be

To obtain additional information on equipment described on this page, see lower part of page 154.



New Type Reduction Drive Brought out by the American Pulley Co.

carried in stock by dealers, ready for immediate delivery. For speeds lower than 11 R.P.M., special reduction units can be assembled. Occasional lubrication is the only attention required by the unit. 85

McKenna Improved Tungsten-Carbide Tool Material

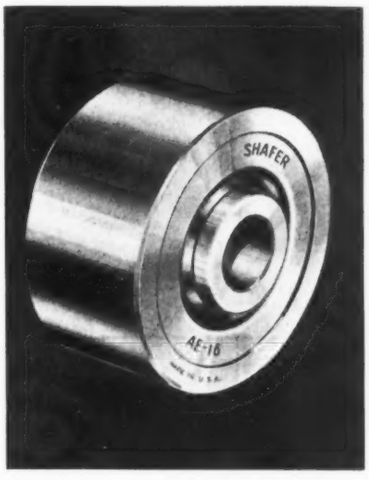
A straight tungsten-carbide grade of Kennametal which is claimed to be approximately 15 per cent stronger than previous grades of the same hardness has just been placed on the market by the McKenna Metals Co., 147 Lloyd Ave., Latrobe, Pa. This new tungsten-carbide tool material, known as Kennametal Grade K4, has a hardness of 92 Rockwell A and a strength of 223,000 pounds per square inch (transverse rupture test). Improved methods of carbide manufacture developed for the production of the steel-cutting grades of Kennametal are said to be responsible for the increased hardness and strength of this material.

A high thermo-conductivity, together with the unusually high wear resistance of the Grade K4 material, makes it particularly suitable for machining hard, crumbly materials, such as cast iron, Bakelite, porcelain, hard rubber, glass, silicon aluminum, hard bronze, and other non-ferrous materials. Tools made of Kennametal Grade K4, as well as blanks of the material, are available. 86

Shafer Aircraft Type, Self-Aligning, Roller Bearings

To meet the demand for self-aligning bearings of increased load-carrying capacity for aircraft control surface mountings and connections, landing-gear controls, and other aircraft mechanisms, the Shafer Bearing Corporation, 35 E. Wacker Drive, Chicago, Ill., has developed a line of heavy-duty, self-contained, single- and double-row roller bearings of large load capacity and maximum self-aligning action. These bearings are available in a variety of mountings, with bores ranging from 0.1895 to 0.9995 inch in diameter, and outside diameters ranging from 1.2500 to 3.5000 inches.

These bearings have concave rollers which run between convex raceways. This simple arrangement is designed to provide high-duty roller-bearing capacity and efficient self-aligning action within the bearing itself, and thus permit a considerable reduction in weight. The inner race is a true spherical element, which is free to move in any direction without affecting the contact with the rollers.



Shafer Self-aligning Roller Bearing Designed for Aircraft Controls and Mechanisms

The double-row, self-contained bearings, with the rollers placed in an angular position with relation to the shaft, provide for thrust loads, as well as radial loads. Lubrication is effected by a high-grade grease composed of mineral oil solidified with calcium soap, which conforms to the Air Corps Specifications for a low-temperature grease that is suitable for aircraft controls and accessories. 87

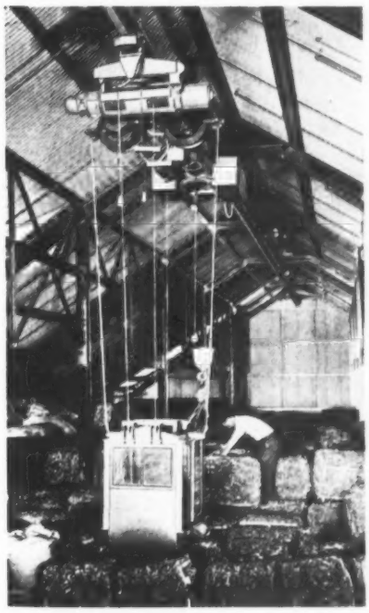
Link-Belt "Friction Fighter" Bearings

The Link-Belt Co., Indianapolis, Ind., has recently adopted a novel means of identifying its five different types of anti-friction bearings with the relative types of service for which each is intended. The whole line, consisting of Series 100 ball bearings, and Series 400, 500, 600, and 7200 self-aligning roller bearings, is now designated "Friction Fighter" bearings, the different types being classified as follows: Flyweight, Series 100; Welterweight, Series 400; Middleweight, Series 500; Heavyweight, Series 600; Alternate Heavyweight, Series 7200. 88

Link-Belt Series 600 Heavyweight Friction Fighter Roller Bearing

Tramrail Carrier with Raising and Lowering Cab

The Cleveland Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio, has developed a new type of tramrail carrier with a cab that can be raised or lowered. The equipment is available in



Cleveland Tramrail Carrier with Cab that can be Raised or Lowered

To obtain additional information on equipment described on this page, see lower part of page 154.

two general forms. One form provides for the raising and lowering of the cab and load simultaneously, while the other provides for cab and load raising independently of each other. The type employed depends on the service and materials to be handled.

With the raising and lowering cab unit, one operator can take care of all operations involved in removing materials, such as attaching the load to the crane hook, and detaching and operating the tramrail unit. If the materials are handled with a lifting fork, the operator can handle the work the same as with a crane hook. The unit illustrated is engaged in handling unwieldy loads of cork, the cab and load hook being operated independently of each other. 89

Leslie Hand Punch Press

The Leslie Welding Co., 2943 Carroll Ave., Chicago, Ill., has brought out a hand-operated punch press that has no ram, ways, or slides, and yet is claimed to have the accuracy of the conventional leader-pin type of die set. It is especially adapted for blanking or punching small stampings or for punching along the edges of large sheets.

A unique feature of this machine is the unusual means for maintaining alignment or registration of the punches or dies. This is accomplished by employing a leaf arm that is rigid except at its flexing point. Because of the rigidity of the leaf arm and the unusually wide bearing of the operating eccentric, it is claimed that it is unnecessary to center the load on the punch-plate.

The punch-plate is 4 by 4 1/4 inches, and is designed to accommodate the blanking punches ordinarily used on small power presses. The clearance from the punch-plate center to the frame is 6 inches, the stroke is 7/16 inch, and the stroke adjustment is 1/8 inch. The press has a capacity for punching holes up to 2 inches in diameter through 14-gage mild steel or 16-gage 18-8 stainless steel. 90

Hand-operated Punch Press Made by the Leslie Welding Co.

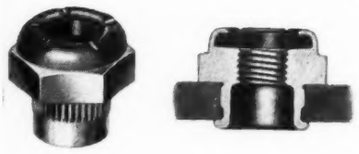
Skilsaw Compact Belt Sander

A light-weight, 2 1/4-inch belt sander called the "Zephyrplane Junior" is being marketed by Skilsaw, Inc., 5039 Elston Ave., Chicago, Ill. This compact sander is adapted for use in industrial trade schools and wherever a small sander is required for polishing or removing varnish, etc. It has a die-cast aluminum frame, ball-bearing construction, and a universal motor. The belt travels at a speed of 600 feet per minute, is kept uniformly taut by a coil spring, and can be easily centered by a simple adjustment. A variety of belts are available for use on wood and metal. The complete sander weighs only 9 1/2 pounds. 91

Skilsaw Light-weight Sander

Knurled-Shank, Clinch Type, "Elastic Stop" Nut

A clinch type, self-locking nut with a knurled shank for fastening sheet-metal assemblies in such a manner that the parts can be readily removed and returned to their original positions has been added to the line of the Elastic Stop Nut Corporation, 2332 Vauxhall Road, Union, N. J. To install this nut, the shank is pressed into a hole drilled in the structure. The mouth of the shank is then spread against the back of the structure, as shown in the view to the right in the illustration, in order to effect a clinching hold. The knurling engages the drilled surface and thus assists in eliminating any turning movement of the nut.



Self-locking Nut for Sheet-metal Assemblies

The head of the nut is fitted with the vulcanized fiber collar which characterizes all types of "Elastic Stop" nuts. This collar, being unthreaded, resists the entrance of the screw, thus automatically taking up all thread play and bringing the load-carrying thread faces of nut and screw into a tight pressure-contact that prevents loosening, even under the most severe vibration. The resilient character of the fiber collar permits the screw to be removed and replaced repeatedly without destroying the locking action. These nuts are available in a complete range of sizes, thread systems, shank lengths, and materials. 92

Small Speed Reducer

The Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio, has just placed on the market a small speed reducer designated BHU, which has been undergoing field tests for more than a year. This speed reducer is 5 5/8 inches high, the other dimensions being 5 3/8 by 3 inches, and it is especially adapted for use with fractional-horsepower motors. It is made in three assemblies, with the output shaft projecting to the right, to the left, or to both right and left.

BHU Speed Reducer for Fractional-horsepower Motors

To obtain additional information on equipment described on this page, see lower part of page 154.

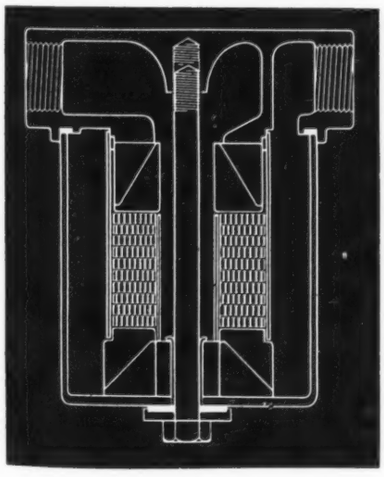
Six stock ratios are available between 10 to 1 and 48 to 1. A bronze worm-wheel and a hardened and ground worm operate in Timken roller bearings. The torque capacity is 150 inch-pounds. 93

Frantz Permanent-Magnet "FerroFilter"

A permanent-magnet oil filter designed to magnetically extract coarse and fine iron particles from suspension in lubricating-oil circulating systems has just been placed on the market by the S. G. Frantz Co., Inc., 161 Grand St., New York City. This filter, known as Series PQ, is made in two models.

The Model P3Q, made for connection with 1-inch pipe, has a capacity for handling 20 gallons of oil per minute. This filter is 8 inches high, measures 5 3/4 inches over the pipe connections, has a shell 4 1/2 inches in diameter, and weighs 12 pounds. The Model P2Q, made for connection with 3/4-inch pipe, has a capacity of 10 gallons per minute, is 5 3/4 inches high, measures 4 3/8 inches over the pipe connections, has a shell diameter of 3 1/4 inches, and weighs 6 pounds. Both models will operate under working pressures up to 100 pounds per square inch.

These filters will handle the full lubricating oil flow for Diesel and internal-combustion engines, turbines, and aircraft test and run-in stands, and can be set close to the engine in the oil-pipe line, so that they become a part of the lubricating oil system. Powerful permanent magnets are located at the top and bottom of the filter, with the "FerroFilter" screens located in a cylinder between them, as indicated in the accompanying diagram. These screens are similar in construction to the ones used in the larger filter shown in October MACHINERY, page 171. A feature of the filter is the facility with which the screens can be removed for cleaning or inspection. This is accomplished by simply removing the center bolt, the head of which projects from the bottom of the filter body. 94



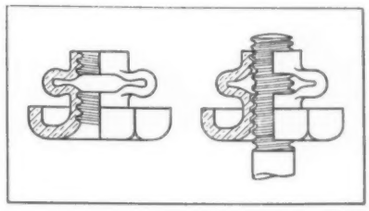
Construction of Easily Cleaned Magnetic Oil Filter Made by S. G. Frantz Co., Inc.

Sprockets with Small Size Roller Chain

Diamond Small Size Roller Chain

An 8-millimeter roller chain which weighs 1 3/4 ounces per foot, or about half as much as the smallest power-transmission chain previously produced in the United States, is now being made by the Diamond Chain & Mfg. Co., Indianapolis, Ind. This No. 88 chain was developed to provide dependable service in applications for which the larger size chains are too heavy or bulky.

Notwithstanding its small dimensions—0.315-inch pitch, with rollers 0.197 inch in diameter by 0.125 inch in width—the No. 88 roller chain has an average ultimate strength of 1100 pounds, and is made to the same standards as the larger chains of this company's manufacture. The chain is adapted for operation at extremely high speeds, and applications for which maximum compactness without sacrifice of enduring accuracy is essential, as required for the positive driving of light-weight machinery, for timing mechanisms, precision instruments, models, etc. 95



Boots Vibration-resisting Self-locking Nut

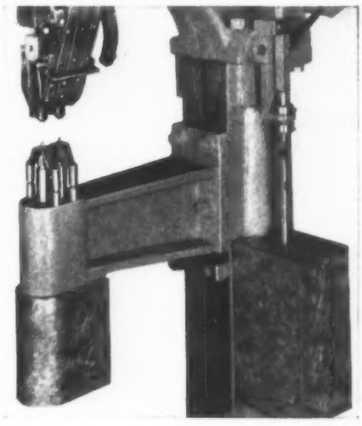
Boots Wing Style Self-Locking Nut

A new vibration-resisting self-locking nut of the wing style has been placed on the market by the Scovill Mfg. Co., Waterbury, Conn., manufacturer and distributor of this product for the Boots Aircraft Nut Corporation. When applied, the spring member of the nut automatically expands to the locking position shown in the view to the right in the illustration.

In addition to the self-locking feature, this nut is 10 to 50 per cent lighter, and generally, size for size, costs less than the solid type nut. It is of one-piece steel construction, cadmium-plated, and is designed to reduce assembly costs. The sizes now available range from No. 6 to 1/4 inch. This nut, with variations in design, can be furnished for special purposes. 96

Electrically Actuated Automatic Riveter

A new type automatic multiple rivet-setter which is electrically actuated when the work is placed over the anvils has been developed by the



Automatic Multiple Rivet-setter Built by the Chicago Rivet & Machine Co.

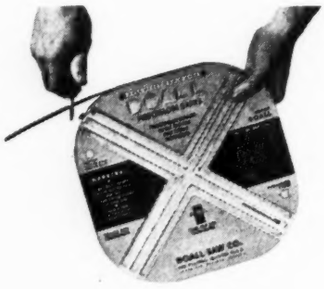
To obtain additional information on equipment described on this page, see lower part of page 154.

Chicago Rivet & Machine Co., 1830 S. 54th Ave. (Cicero P. O.), Chicago, Ill. This riveter requires no foot motion on the part of the operator, and the builders claim that it will function at a higher production speed and maintain a better, more uniform quality of work than previously obtained with foot-controlled machines.

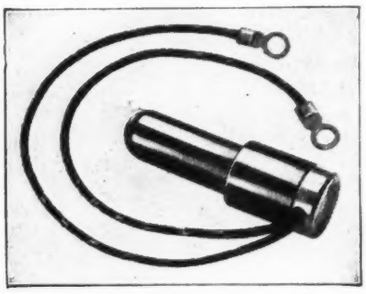
In the two-rivet model (shown in the illustration on page 169), the operator places the work over the projecting parts of the anvil and brings the pieces down, exerting a slight pressure on the work-rest to close an electrical circuit through a Micro switch in the lower housing. This trips a solenoid which engages the flywheel clutch, feeding and setting the rivets of a single stroke of the machine. If the work is incorrectly positioned, the switch cannot be closed and the rivets will not be fed into place. This protects the operator and reduces work spoilage to a minimum. The new operating equipment described is obtainable with all automatic riveters made by this company. 97

DoAll Band-Saw Container

An improved container for band saws in the form of a metal box has been brought out by the DoAll Co., 1201-1225 Thacker St., Des Plaines, Ill. This container is so designed that it can be easily held in one hand while the saw is pulled out with the other hand, in the same manner that a tape measure is drawn out. Each box contains 100 feet of saw blade. A window in the side of the box enables one to determine the amount of saw blade in the container. 98



DoAll Metal Band-saw Container



Unbreakable Mercury Switch of Increased Capacity

Durakool Unbreakable Mercury Switches

To meet the demand for larger electrical capacities in switches with smaller over-all mechanical dimensions, Durakool Inc., 1010 N. Main St., Elkhart, Ind., has developed two new mercury switches known as Nos. A-5M and A-10Z. Both switches have new internal construction characteristics that enable them to carry substantially greater currents than the regular Durakool switches of the same dimensions. 99

Machine and Tool Progress Exhibition

Under the sponsorship of the American Society of Tool Engineers, 2567 W. Grand Blvd., Detroit, Mich., a Machine and Tool Progress Exhibition will be held in Convention Hall, Detroit, beginning March 25, 1941.

Laying out a Department in the Pontiac Plant. All the Machines are Represented by Tiny Cardboard Models, Cut out to Scale, which are Moved about on a Large Board to Determine how to Place the Machines to Obtain the Most Efficient Sequence of Operations

The object of this exhibition is to present to industry the latest developments in shop equipment, processes, tools, and materials. The show will give special emphasis to tools and equipment available for speeding up defense production. It is intended to enable the men responsible for specifying and selecting tools and equipment for National Defense work to view under one roof many of the most recent developments designed to speed up armament production. Owing to the unprecedented demand for space, the total exhibit area was recently increased beyond the preliminary plans. Space reservations are already ahead of those of the entire 1938 show.

In connection with the show, the annual convention of the American Society of Tool Engineers will be held in the Exhibition Building. Frank Shuler, of the Chrysler Corporation, Detroit, is chairman of the Show Exhibit Committee.

* * *

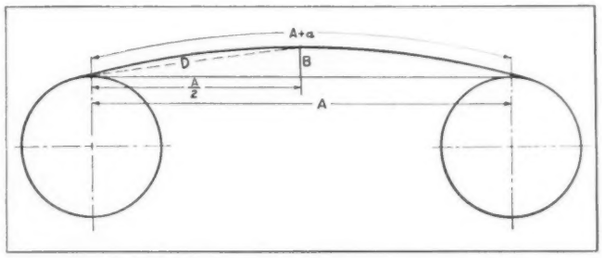
Recently, rustproof fish-hooks having the strength of steel hooks have been developed by using a high-nickel alloy containing as much as 98 per cent of pure nickel.

To obtain additional information on equipment described on this page, see lower part of page 154.

Method of Calculating Sprocket Chain Clearance

By H. R. BOWMAN, Engineering Department
Crown Cork & Seal Co., Baltimore, Md.

I recently had occasion to design a sprocket chain drive in which there was very little clearance between the slack side of the chain and a cross member. It was necessary to compute the distance that this side of the chain would be flung outward by centrifugal force when in operation at high speed. In being flung outward, this side of the chain will form a catenary curve, which, for practical purposes, may be treated as an arc of a circle.



Method of Calculating Sprocket Chain Clearance

In the following formulas (see illustration):

A = distance between the points at which the slack side of the chain leaves one sprocket and enters the other while in action. (This may be assumed as approximately equal to the distance between the centers of the sprockets.)

a = amount that slack side of chain is longer than A. (This amount is equal to the allowance made for easy running plus an additional amount for stretch due to wear.)

B = greatest distance that the slack side moves outward from a straight line tangent to the two sprockets.

D = distance from the last point of contact with one sprocket to the middle point of the chain. (For simplicity, the point of contact is assumed to be on the vertical center line.)

Now we have a right-angle triangle with sides equal to D, B, and $\frac{A}{2}$; then

$$B = \sqrt{D^2 - \left(\frac{A}{2}\right)^2} \qquad (1)$$

Since D is the chord of half the arc $A + a$, we can use the approximate equation for the length of the chord of half an arc in terms of the length of the chord of the full arc, and the length of the full arc:

$$D = \frac{3\,(A + a) + A}{8} \qquad (2)$$

The value of D from Equation (2) may be substituted in Equation (1) to solve for B.

Should the curve formed by the slack side of the chain be treated as a catenary, the following approximate equation may be used:

$$A + a = A\left[1 + \frac{2}{3}\left(\frac{2B}{A}\right)^2\right] \qquad (3)$$

It is surprising how much this outward movement of the slack side of a chain will amount to. In a case where A is 12 inches and a is 5/32 inch, the distance B will be about 7/8 inch. This is an important element to consider when allowing clearance for a chain guard.

* * *

Stack-Cutting Reduces Costs by Twenty-Five Per Cent

In the production of the revolving sealing doors for concrete mixers, the manufacturers were able to save 25 per cent of the cost by the use of the stack-cutting oxy-acetylene flame process. In this manner, fifteen sealing doors were cut to shape at once. These doors are fabricated from 10-gage steel with a carbon content of from 0.35 to 0.45 per cent. Each completed door is in the form of a ring, with an outside diameter of 34 inches and an inside diameter of 22 inches. The tolerance on both inside and outside diameters is only 1/64 inch. Of recent years, stack-cutting has become a more and more generally accepted process.

Frederick V. Geier, President of Cincinnati Milling Machine and Cincinnati Grinders, Inc., Who has been Elected President of the National Machine Tool Builders Association

NEWS OF THE INDUSTRY

California

AIR ASSOCIATES, INC., 1100 Airway Drive, Grand Central Airport, Glendale, Calif., manufacturer of special parts and equipment for the aviation industry, announces that it will start construction shortly on a $200,000 one-story plant at the Los Angeles Municipal Airport.

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., announces the construction of a new warehouse in Los Angeles, Calif., situated on Pacific Blvd.

Illinois and Missouri

W. M. BLACK was appointed president of the American Manganese Steel Division of the American Brake Shoe & Foundry Co., Chicago, Ill., at a recent meeting of the board of directors. Mr. Black previously served as a vice-president and general sales manager of this division. He succeeds W. E. CROCOMBE, who remains president of the American Forge Division of the company.

JOHN F. DITZELL has been appointed general sales manager of the Shafer Bearing Corporation, 35 E. Wacker Drive, Chicago, Ill., manufacturer of self-aligning roller bearings and power transmission bearing equipment. Mr. Ditzell was a sales executive of the Stewart-Warner-Alemite Corporation for a number of years.

DOALL CO., 1201 Thacker St., Des Plaines, Ill., announces the opening of a new factory for producing narrow precision band saws for metal cutting. The new construction consists of an addition containing 7800 square feet of space to a factory building purchased about a year ago that originally contained 7800 square feet of space.

ILLINOIS GAGE CO., 3753 N. Kilbourn Ave., Chicago, Ill., is now engaged in the production of standard and special types of precision gages. The company is making a specialty of "Go" and "No Go" plug and ring gages.

DETROIT REX PRODUCTS CO., manufacturer of degreasing machines, solvents, and cleaning equipment, has moved its Chicago office to larger quarters at 1166 W. Cermak Road.

TWIN DISC CLUTCH CO., Racine, Wis., has opened a new branch office at 1701 Delmar Blvd., St. Louis, Mo., in order to extend the service and engineering facilities to operators of Twin Disc products in that territory. HENRY WIRRY will handle sales and engineering at the new office, and there will also be available a staff of expert service men to handle any service work required on Twin Disc clutches, hydraulic drives, etc.

Michigan

HAMMOND MACHINERY BUILDERS, Kalamazoo, Mich., announce the purchase of the Automatic Polishing and Buffing Machinery Division of the CONTINENTAL ROLL AND STEEL FOUNDRY CO., East Chicago, Ind., and its removal to Kalamazoo. The Continental automatic line complements the Hammond line of larger rotary and "Strait Line" automatic polishers and buffers, as well as the Hammond line of polishing and buffing lathes and grinders. HAROLD W. FAINT and LAWRENCE MAJOR, formerly with the Continental organization, are now connected with Hammond Machinery Builders.

COLONIAL BROACH CO., Detroit, Mich., announces that it has recently broken ground on Hoover Road for the construction of a new plant, which will comprise about 20,000 square feet of manufacturing space and will provide increased facilities for the manufacture of broaching machines, jigs, and fixtures. The production of broaches, drill jig bushings, New Method steel stamps, marking devices, etc., will be conducted at the main plant of the company at 147 Joseph Campau. The new plant is expected to be ready for operation about January 1.

CAMPBELLS CADILLAC MACHINERY CO. has been organized to deal in machine tools and other metal-working machinery, with offices at 110 E. Hancock St., Detroit, Mich. COLIN L. CAMPBELL, for many years well known in the machine tool trade in the Detroit territory, heads the organization.

BRUCE P. HETLER, formerly general sales manager of the Blackmer Pump Co., Inc., Grand Rapids, Mich., has been made manager in charge of engineering sales, and J. B. TROTMAN has become general sales manager in charge of sales distribution and advertising.

DOW CHEMICAL CO. recently held a sales conference at the general offices of the company in Midland, Mich. Two hundred representatives of the company and their wives from Canada, Mexico, and many parts of the United States attended the conference.

L. M. BENKERT, general manager of the Progressive Welder Co., Detroit, Mich., is to be the principal speaker at the next meeting of the American Welding Society to be held in Chicago on December 20. His address, entitled "Spot Welding—Why and How," will be illustrated by slides and motion pictures.

ANKER-HOLTH MFG. CO., INC., Port Huron, Mich., has acquired the physical assets of the AIRGRIP CHUCK CO., Detroit, Mich. Operations will be transferred to Port Huron, and will be under the direction of LEO T. NEIDOW, founder of the latter company.

CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio, announces that it has removed the Detroit branch of the company from the Insurance Exchange Bldg. to 213 E. Columbia St., where greatly enlarged quarters have been obtained.

New England

BULLARD CO., Bridgeport, Conn., announces that it has recently completed the construction of a large foundry extension. The new foundry measures 360 by 94 feet, and will provide additional facilities required to fill orders resulting from the National Defense Program. The building was erected by the Turner Construction Co. of New York City. It was completed in seventy days.

G. H. SANBORN, of the Fellows Gear Shaper Co., Springfield, Vt., spoke before the Rockford Chapter of the American Society of Tool Engineers at its meeting on November 7 in Rockford, Ill., on the subject "New Developments in Gearing."

New Jersey

P. W. BROWN, formerly general superintendent of the Wright Aeronautical Corporation, Paterson, N. J., has been made assistant works manager. PHILIP B. TAYLOR, chief engineer, has been made assistant general manager, and will be succeeded by RAYMOND W. YOUNG, formerly assistant chief engineer. ARTHUR H. LEAK becomes assistant chief engineer.

HAROLD B. THOMAS, one of the founders of the Elastic Stop Nut Corporation, 2332 Vauxhall Road, Union, N. J., and vice-president in charge of sales, has resigned to enter consulting work in industrial product analysis and market research. He will remain a director and member of the executive committee of the corporation.

F. L. CURTIS, treasurer of Raybestos-Manhattan, Inc., and general manager of the Manhattan Rubber Mfg. Division, Passaic, N. J., was elected a director of the Rubber Manufacturers' Association at the annual meeting on October 17 in New York City.

New York

RALPH S. PELTON, of the Schenectady Works Laboratory of the General Electric Co., has won prizes for two papers, "Fundamentals of Resistance Welding" and "Applications for Pulsation Welding Broadens the Field of Resistance Welding" in a contest sponsored by the American Welding Society. The first mentioned paper was awarded a second prize of $200, and the second paper, which was written in collaboration with H. C. COGAN of the National Electric Welding Machines Co., took fourth prize. The awards were made at the recent annual convention of the Society.

W. C. LIPE, INC., Syracuse, N. Y., announces that construction is under way for an addition to the company's plant in Syracuse to provide for the expansion of the Machine Tool Division, which manufactures the Lipe mechanical Carbo-Lathe, the hydraulic Carbo-Matic, and the 9-inch production lathe. The building is expected to be ready for occupancy early in December.

GENERAL ELECTRIC CO. has announced plans for the erection of a second large building at its Schenectady Works. It will be of brick and steel construction, 560 feet long and 240 feet wide. Offices will be located in a two-story section across the front, and the remainder of the building will be used for storage.

WARD LEONARD ELECTRIC CO., Mount Vernon, N. Y., manufacturer of electric controlling devices, announces the opening of a branch office in Rochester, N. Y. The new office, located in the Lincoln Alliance Bank Building, 183 Main St., East, will be managed by J. K. SAVAGE, sales engineer.

J. A. WILLIAMS, formerly assistant to the vice-president and general manager of the Curtiss Aeroplane Division of the Curtiss-Wright Corporation, Buffalo, N. Y., has been appointed manager of the organization's new aircraft factory now being built at Port Columbus, Columbus, Ohio. Mr. Williams has been connected with the Curtiss organization since 1921.

ROLLWAY BEARING CO., INC., Syracuse, N. Y., announces that ground has been broken on a site adjoining its present location to provide plant capacity for its expanding business. The new building will be devoted to bearing assembly and shipping facilities.

POWELL PARDEE has been appointed district sales manager of the Inland Steel Co. in New York City, with offices at 40 Wall St.

Ohio

WILLIAM SPRAGUE, technical secretary of the American Welding Society and editor of the *Welding Journal*, was awarded the 1940 Samuel Wylie Miller Memorial Medal for his conspicuous contributions to the art and science of welding during twenty-one years in the field, at the recent annual meeting of the American Welding Society in Cleveland. H. J. FRENCH and T. N. ARMSTRONG, JR., metallurgists of the International Nickel Co., New York City, were awarded the Lincoln Gold Medal, donated by James F. Lincoln, president of the Lincoln Electric Co., for their paper "Weld Hardening of Carbon and of Alloy Steel," presented at the annual meeting of the Society in 1939.

HENRY H. TIMKEN, JR., has been named chairman of the board of the Timken Roller Bearing Co., Canton, Ohio. He will succeed his father, the late Henry H. Timken, Sr., in this capacity, and will continue as vice-president and general manager of the Steel and Tube Division of the company. Mr. Timken has been associated with the company since his graduation from Harvard University, and has been a director for ten years. JOHN E. FICK, superintendent of the Steel Mill, has been added to the board. He has been affiliated with the company for more than twenty years.

NATIONAL MACHINERY CO., Tiffin, Ohio, held Open House October 27 to 30 with the object of giving the residents of the city in which the plant is located and of the surrounding district an idea of how the products made on the company's machines enter into their everyday lives, assisting and creating employment, and making it possible for "more people to have more things." During the Open House period, more than 15,000 visitors passed through the plant.

MONARCH MACHINE TOOL CO., Sidney, Ohio, on the evening of October 22 entertained the members of the Associated Machine Tool Dealers of America who were assembled for their annual convention at Dayton, Ohio. A dinner was served to the guests at the company's plant in Sidney; afterward, the members inspected the Monarch plant, including the modern buildings recently erected and equipped. The event was one of the highlights of the Machine Tool Dealers' meeting.

GEORGE W. CURTIS has been appointed Milwaukee division manager of the Timken Roller Bearing Co., Canton, Ohio. Industrial and automotive bearing sales, as well as alloy steel sales activities of this division, will be under his supervision. Mr. Curtis was previously district manager of the Industrial Division.

R. S. CLINGAN has been appointed Chicago district manager of the Copperweld Steel Co., Warren, Ohio, and will handle the sale of Aristoloy alloy steels. For the last ten years Mr. Clingan has been connected with the Republic Steel Corporation.

Frederick B. Scott, Jr., of the Syracuse Supply Co., Who was Recently Elected President of the Associated Machine Tool Dealers of America

Pennsylvania and Maryland

GEORGE H. BUCHER, president of the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., and fifteen other employes at the company's Pittsburgh offices recently received gold emblems in recognition of thirty or more years of service with the Westinghouse organization. A. W. Robertson, chairman of the board, presented the awards. More than 21,000 other Westinghouse employes, who have been with the company ten years or more, are receiving awards this year. Mr. Bucher enrolled as a member of the graduate students' training course of the company in 1909. He began winding coils in the shop at a wage of 18 cents an hour. He was elected president of the company in 1938.

№ 000 - *HIGHER* PRODUCTION

BROWN &

AND *GREATER* ACCURACY
On Small Parts Milling

Quick, accurate set-up for most efficient operation

— Broad, independent ranges of feed and speed

— Fine longitudinal adjustment for positioning work

— Accurate, conveniently-made spindle adjustments

Automatic milling cycle

— Fast travel to cut — Automatic engagement of cutting feed — Fast travel back to loading position

— Any length of cut from ¼" to 5½"

— Table will reverse within accuracy of .002"

— Spindle runs in either direction — set to rotate continuously or to stop when table stops

Smooth operation — Ample rigidity

Whether individually or in a battery, as shown at the left, No. 000 is highly profitable for milling in a broad range of materials.

B·S

Let us send further information on this productive machine —for efficient milling of small work. Brown & Sharpe Mfg. Co., Providence, R. I., U.S.A.

SHARPE

McKenna Metals Co., Latrobe, Pa., has announced completion of arrangements under which the United States Steel Export Co. will sell Kennametal tools, tool blanks, drawing dies and wear-resisting parts to foreign markets. The new arrangement does not affect the sales agreement in effect with George H. Alexander Machinery, Ltd., Birmingham, England, who have the British patent rights to Kennametal and are the sales agents for Great Britain and British possessions; nor does it affect the manufacture and sale of this product in Canada, which are carried on by Kennametal of Canada, Ltd., Hamilton, Ontario, Canada.

Dr. Frank Conrad, who began his career in science as a bench-hand with the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., and became internationally known as the father of radio broadcasting, has completed fifty years of achievement which has brought him to his present position as assistant chief engineer of the company. In recognition of his service, he was presented with a diamond-studded, gold lapel emblem on the twentieth anniversary of the first regularly scheduled radio broadcast, for which he was responsible.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces that it will spend half a million dollars in expanding the facilities of its lighting division at Cleveland, Ohio. The expansion involves four new buildings and operating equipment. The Austin Co., of Cleveland, has been awarded the contract for designing and building.

Eugene R. Perry has been promoted to the position of manager of engineering and superintendent of the Micarta Works of the Westinghouse Electric & Mfg. Co. at Trafford, Pa. Mr. Perry, who has been associated with the organization since 1929, has been acting superintendent of the Micarta Works since May of this year.

C. E. Harrison, vice-president of the American Engineering Co., Philadelphia, Pa., has been appointed general manager. He will have general supervision of the entire activities of the company in addition to filling his duties as vice-president. He has previously held the position of works manager of the company.

Stanley A. McCaskey, Jr., has been appointed to an executive position with the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. Mr. McCaskey is a graduate of Harvard Law School, and has been admitted to practice before the Pennsylvania Supreme Court and the Supreme Court of the United States.

David S. Lewis has been appointed assistant to T. W. Pennington, sales manager of the Jessop Steel Co., Washington, Pa. Mr. Lewis joined the sales department of the company in 1928.

Leon R. Ludwig has been appointed manager of two newly combined sections of the Westinghouse Electric & Mfg. Co.'s Switchgear Division at East Pittsburgh, Pa.

Glenn L. Martin, president of the Glenn L. Martin Co., Baltimore, Md., has been awarded the Daniel Guggenheim Medal for 1940. The medal will be presented to Mr. Martin at the Honors Night Dinner of the Institute of the Aeronautical Sciences in New York on January 28. It is awarded to Mr. Martin "for contributions to aeronautical development and the production of many types of aircraft of high performance."

Wisconsin

Meehanite Research Institute of America, Inc., Milwaukee, Wis., recently held its twelfth annual meeting at which the following officers were re-elected for 1941: President, Oliver Smalley, president of the Meehanite Metal Corporation, Pittsburgh, Pa.; vice-president, H. B. Hanley, American Laundry Machinery Co., Rochester, N. Y.; secretary-treasurer, Frank M. Robbins, president of the Ross-Meehan Foundries, Chattanooga, Tenn. Over eighty representatives of Meehanite foundries in the United States and Canada were present for the discussion and distribution of more than forty research papers which had been prepared during the year. A feature of the meeting was the celebration of Mr. Smalley's birthday and the surprise presentation by the group of a large birthday cake.

W. T. Roundy has been transferred from the Atlanta office of Cutler-Hammer, Inc., Milwaukee, Wis., electric control manufacturer, and has been assigned to the state of Florida. He will make his headquarters at Orlando.

* * *

Inspectors Required by the Government

Procurement inspectors are needed by the Air Corps, Wright Field, Dayton, Ohio, for the inspection of aircraft engines, instruments, parachutes, aircraft propellers, tools, and gages. For the junior grade inspectors, college graduation in aeronautical, mechanical, or electrical engineering may be substituted for practical experience. For the upper grade inspectors, mechanical experience, which may include apprenticeship, is required in the branch applied for, except that the experience on engines, instruments, tools, and gages need not be in aircraft work. For further information, apply to Secretary, Board of U. S. Civil Service Examiners, Wright Field, Dayton, Ohio; or to any first- or second-class post office.

COMING EVENTS

December 2-5—Annual meeting of the American Society of Mechanical Engineers in New York City. C. E. Davies, secretary, 29 W. 39th St., New York City.

December 2-7—Fourteenth National Exposition of Power and Mechanical Engineering to be held at the Grand Central Palace, New York City. For further information, address International Exposition Co., Grand Central Palace, New York City.

December 11-13 — Forty-fifth annual Congress of the National Association of Manufacturers at the Waldorf-Astoria Hotel, New York City. For further information, address the Association's headquarters, 14 W. 49th St., New York City.

December 11-15—National Chemical Exposition at the Stevens Hotel, Chicago, Ill. For further information, address National Chemical Exposition, 110 N. Franklin St., Chicago, Ill.

January 6-10, 1941—Annual meeting of the Society of Automotive Engineers at Book-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

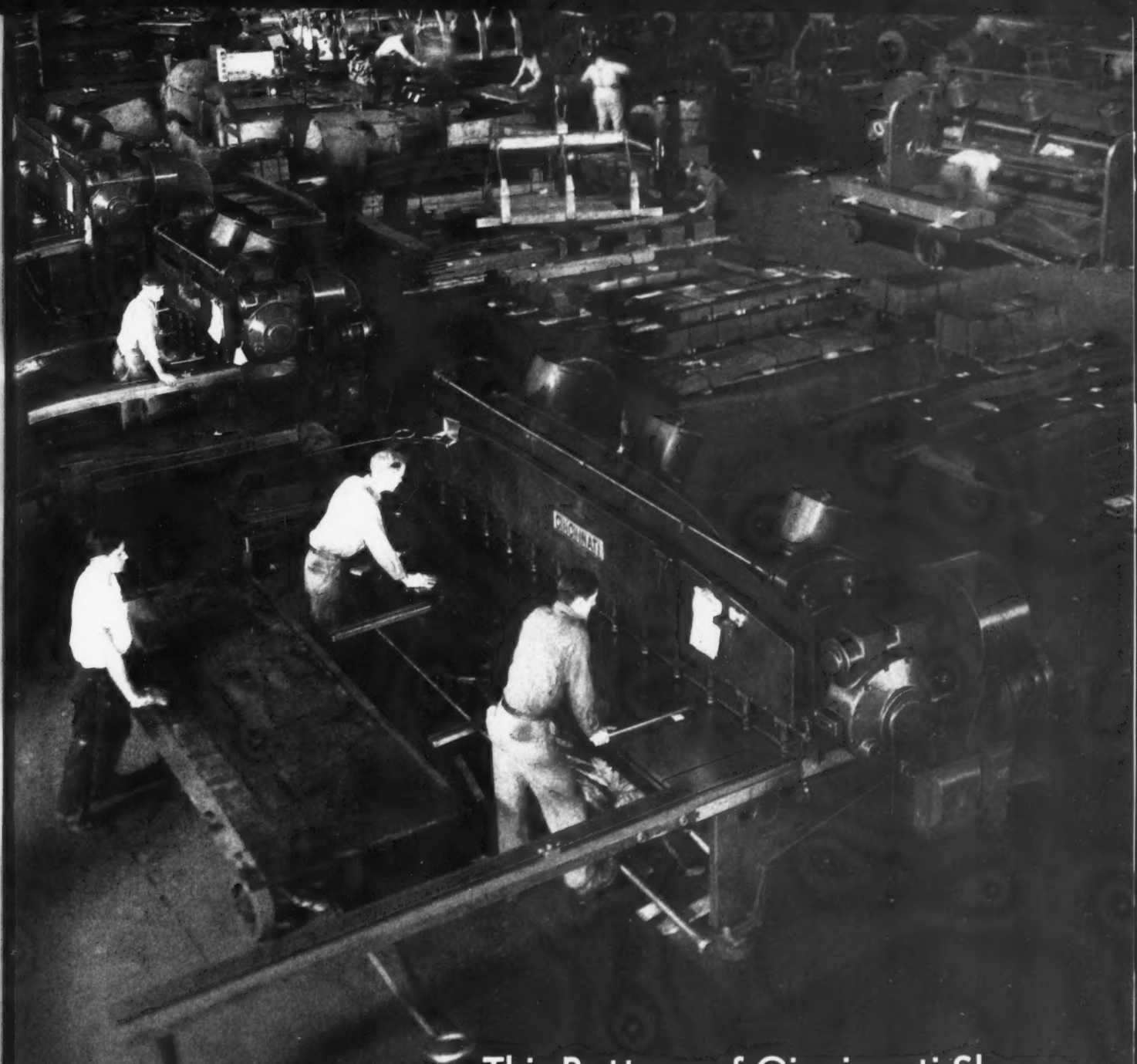
March 24-29, 1941—Machine and Tool Progress Exhibition at Convention Hall, Detroit, Mich., under the auspices of the American Society of Tool Engineers, 2567 W. Grand Blvd., Detroit, Mich.

March 25-29, 1941—Machine and Tool Progress Exhibition, under the sponsorship of the American Society of Tool Engineers, to be held in Convention Hall, Detroit, Mich. For further information, address Ford R. Lamb, executive secretary, 2567 W. Grand Blvd., Detroit, Mich.

April 1-3, 1941—Spring meeting of the American Society of Mechanical Engineers at Atlanta, Ga. C. E. Davies, secretary, 29 W. 39th St., New York.

May 19-23, 1941—Western Metal Congress and Exposition to be held in Los Angeles, Calif., under the auspices of the American Society for Metals. The Congress will have headquarters at the Biltmore Hotel, and the Exposition will be held in the Pan American Auditorium. W. H. Eisenman, secretary, 7301 Euclid Ave., Cleveland, Ohio.

June 16-20, 1941—Semi-annual meeting of the American Society of Mechanical Engineers at Kansas City, Mo. C. E. Davies, secretary, 29 W. 39th St. New York City.



This Battery of Cincinnati Shears Cuts Tons of Steel Every Hour

When schedules are heavy and shears must shear 'round the clock, the dependability, speed, and accuracy of Cincinnati All-Steel Shears mean extra production, and guarantee against delays.

• • *Capacities from 12 ga. to 1¼"*

Write for Recommendations on Your Job

Photo Courtesy Central Steel and Wire Co.

THE CINCINNATI SHAPER CO.

SHAPERS · SHEARS · BRAKES

CINCINNATI, OHIO.

OBITUARIES

Charles L. Allen

Charles L. Allen, chairman of the board of the Norton Co., Worcester, Mass., and for forty-eight years general manager of the company, died Monday, November 4, at his home in Worcester of bronchial pneumonia.

Mr. Allen was born in Worcester in 1858. After graduation from high school in 1876, he worked for three years in a shoe store, and then, for two years, as a clerk in the Worcester office of the Boston & Maine Railroad. He went with the F. B. Norton Co. as a bookkeeper in 1881 when that organization was a struggling pottery shop employing thirteen men. It was in this shop that the experiments with the first Norton grinding wheels were made which led to the development of a great industrial concern now employing over 6000 people. As a result of these experiments, the Norton Emery Wheel Co. was organized in 1885, at which time Mr. Allen was made general manager, a position which he held until 1933, when he retired from active participation in the company's management.

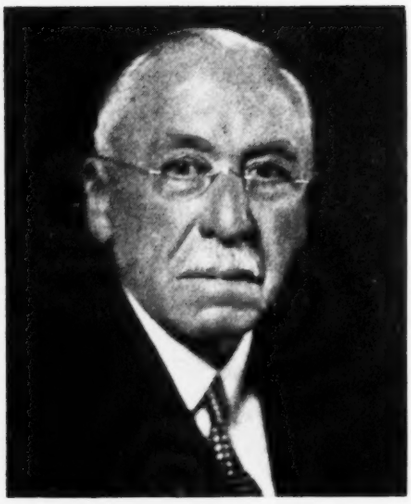
Mr. Allen became secretary and a director of the company in 1892 and treasurer in 1912. When the Norton Co., the successor of Norton Emery Wheel Co., and the Norton Grinding Co. were merged in 1919, Mr. Allen was elected president and general manager of the consolidated Norton Co.

When Mr. Allen retired from the administrative leadership of the company in 1933, he became chairman of the board. With his many years of experience and his clear understanding of the company's activities, he continued to take a leading part in the formulation of its policies.

In 1931, Mr. Allen was decorated with the Order of Vasa by King Gustaf of Sweden. This honor has seldom been bestowed on any American not of Swedish descent. On this occasion, messages from Herbert Hoover and Calvin Coolidge were read, congratulating him on his contributions to the industrial and civic developments of the city where his life work was accomplished.

Mr. Allen's business judgment was widely sought outside of his own business, and he was a director of numerous corporations, among which may be mentioned the Riley Stoker Corporation, the Worcester Manufacturers Mutual Insurance Co., the Liberty Mutual Insurance Co., and the Worcester County Trust Co.

He was also a life trustee and member of the executive committee of the Worcester Polytechnic Institute, and a member of a great number of civic, business, and scientific associations and societies.



Charles L. Allen

Few executives in industry have received more evidences of affection and respect from their employes than Mr. Allen. On numerous occasions the workers of the Norton organization, independently of the company, paid tribute to him, particularly on his birthdays. On his eightieth birthday, the directors presented him with a memorial bronze medal inscribed "Pioneer, Leader, Counsellor, and Friend." This was but one of many occasions when they, as well as his other friends and co-workers gathered to, as they expressed it, "tell you in life what we think of you."

EDWARD FRANCIS SMITH, district manager of the Haynes Stellite Co., Chicago, Ill., died on September 26 at Rochester, Minn., aged fifty-two years. Mr. Smith was born at Hannibal, Mo., and learned the machinist's trade in his father's shop there. He became a sales engineer with the Haynes Stellite Co., a unit of Union Carbide and Carbon Corporation, in 1920, and a few years later was appointed district manager in the Chicago area, which position he held at the time of his death. He was well known as an author and speaker on metallurgical and metal machining subjects, and was prominent in the American Society of Tool Engineers.

HERMAN W. SCHATZ, assistant sales manager of the American Tool Works Co., Cincinnati, Ohio, died at his home in Norwood, Ohio, on October 21. Mr. Schatz was born on March 6, 1883, in Louisville, Ky. He graduated from the Ohio Mechanics Institute, where he was also an instructor in engineering design. For about three years he worked for the Bickford Tool Co. in a designing capacity, and in addition to this, did some free-lance engineering for two or three years. In 1909, he became connected with the American Tool Works Co. as a designing engineer, and was later made eastern sales manager, finally becoming assistant sales manager.

ARCHIE W. LUCAS, for the last eleven years New England sales manager for the Jessop Steel Co. of Washington, Pa., died at the New Haven Hospital on October 26, as the result of a heart condition. Mr. Lucas was a silverware die-cutter by trade, and was for many years the foreman of the silverware die-cutting department for R. Wallace & Sons Co., Wallingford, Conn., where he made his home. In 1919, he joined the sales force of the Crucible Steel Co. of America, and ten years later, became the district manager of the Jessop Steel Co., with office and warehouse at 626 Capitol Ave., Hartford, Conn.

ARTHUR W. GRAHAM, president and treasurer of the Graham Mfg. Co., Providence, R. I., died suddenly on October 14 of a heart attack, at the age of sixty-seven years. In his early mechanical career, Mr. Graham was connected with the American Locomotive Co., the Pratt & Whitney Co., and the Builders Iron Foundry.

CHARLES L. CAMERON, sales engineer of the Monarch Machine Tool Co., Sidney, Ohio, connected with the Newark, N. J., office of the company, died on November 1 of a heart attack. Mr. Cameron had been identified with the selling of machine tools most of his life. He joined the Monarch organization in 1927.

CARL A. EDLUND, president-treasurer of the Edlund Machinery Co., Inc., Cortland, N. Y., recently passed away. Mr. Edlund, who was well known in the machine tool industry, has been president-treasurer of the company since the death of his father, the founder of the organization, who died in 1931.

* * *

Course in Oxy-Acetylene Welding and Cutting

A comprehensive course of classroom exercises and lectures covering oxy-acetylene welding and cutting processes has been prepared by the Air Reduction Sales Co., 60 E. 42nd St., New York City. The course consists of two separate books, one containing a complete set of work sheets, and the other lecture material. The classroom exercises cover both welding and cutting practice. The lectures, which are intended to supplement the exercises, describe the history of the art, the properties of its materials, its theories, and its practical applications in industry. The book containing the classroom exercises sells for 50 cents a copy, and the lecture books for $1 a copy.

* * *

The use of machinery accounts for the difference in the standard of living in this country and in China.

NEW BOOKS AND PUBLICATIONS

McRae's Blue Book (1940-1941). 3624 pages, 8 1/2 by 11 inches. Published by McRae's Blue Book Co., 18 E. Huron St., Chicago, Ill. Price, $15.

This is the forty-eighth annual edition of a well-known buying guide covering all the manufactured products in the United States. The book contains five sections. The first section comprises an alphabetical list of the names of manufacturers, including addresses, and, in some cases, local distributors. The second section consists of an index to all the products listed in the classified section. The classified material or main section of the book, covering over 2500 pages, contains a classified list of all manufactured products, giving the names and addresses of the various manufacturers arranged according to the product. This section is followed by a trade facilities section, listing the leading commercial bodies, banks, railroads, and storage and distributing warehouses in towns of 1000 or more population. The final section of the book contains an alphabetical list of trade names, including the names and addresses of manufacturers of the various trade-named products. It will be realized that a directory of this scope should be of great value to buyers in locating sources of supply, as well as to sellers and others who need to compile mailing lists.

A.S.M.E. Mechanical Catalog and Directory (1941). 502 pages, 8 1/2 by 11 1/2 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York City. Distributed free to members; price to non-members, $3.

Hundreds of equipment and machinery manufacturers have contributed much information to the 1941 edition of this work, thereby increasing its value more than ever in these days of preparedness and increased production to the engineer and manufacturing executive. The edition contains a profusely illustrated catalogue section describing machines, equipment, and materials. This section is followed by a directory in which is included a practically complete and authoritative index to all American manufacturers of metals and alloys, power-plant equipment, power transmissions, instruments, materials-handling apparatus, aircraft power plants, instruments, foundry and machine-shop equipment, heating, ventilating, and air-conditioning machinery, electric motors and controls, equipment for process industries, pumps, fans, compressors, and hundreds of other types of mechanical apparatus. Hundreds of trade names of equipment and materials are also listed.

Composition of Furnace Atmospheres Resulting from Partial Combustion of Gaseous Fuels. 96 pages, 7 by 10 inches; 37 illustrations. Published by the American Gas Association Testing Laboratories, Cleveland, Ohio. Price, $1.25.

This bulletin, recently issued by the Committee on Industrial Gas Research of the American Gas Association, of which F. J. Rutledge is chairman, presents the results of several years of original research on the composition of furnace atmospheres resulting from partial combustion of gaseous fuels. It describes practical means of obtaining furnace atmospheres of a predetermined composition, and provides a guide to methods of interpreting test data obtained on gas-fired furnaces operating with a deficiency of combustion air. It also contains suggestions on how to design combustion chambers and burners to obtain a predetermined composition of flue gases, and outlines new methods for determining the heat content of flue gases containing unburned combustibles. Engineers and metallurgists concerned with the composition of furnace gases and furnace design will find in this book a wealth of information brought out by this original research.

A Handbook of English in Engineering Usage. By A. C. Howell. 433 pages, 5 1/4 by 7 1/2 inches. Published by John Wiley & Sons, Inc., New York City. Price, $2.50.

This book, now in its second edition, has been prepared by the author, who is professor of English at the University of North Carolina, primarily as a guide for the engineer who wishes to make his English clear, accurate, and concise. Not only is the book of value as a handbook for the practicing engineer, but it is also intended to be used as a textbook in college courses for engineering students.

It is ten years since the first edition of this book came from the press. Since then, it has been adopted as a textbook in several technical schools, and it has been recommended for the "Engineers' Book-shelf" of the Engineers' Council for Professional Development. Briefly, the book covers such subjects as the construction of sentences and paragraphs; composition in general; punctuation; grammar; business letters; reports; and technical magazine articles.

Arc-Welding Handbook. By Karl Meller. Translated by J. E. Webb Ginger. 210 pages, 5 by 7 1/2 inches. Published by the Chemical Publishing Co., Inc., 148 Lafayette St., New York City. Price, $3.50.

The object of this handbook is to enable the operator to understand the processes involved in arc-welding and to utilize the results of the latest research in improving and simplifying his work. The book will also be found useful to foremen and others engaged in training welders. The welding engineer should derive considerable interest from the descriptions of equipment and the material relating to the choice and testing of electrodes. It is believed that owners of small shops, who are often thrown entirely upon their own resources, will find much valuable information in this book.

Modern Foremanship and Supervision Under New Deal Legislation. By Harvey B. Rector and W. A. Rinckhoff. 156 pages, 4 1/2 by 7 inches. Published by the Law Research Service, 712 Keith Bldg., Cincinnati, Ohio. Price, $4.50 per copy; in lots of ten or more, $3.50 per copy.

This little book is intended to familiarize foremen and supervisors with the proper procedure regarding unfair labor practices under the National Labor Relations Act, the Fair Labor Standards Act, and the Walsh-Healey Act. It gives information by means of which foremen can perform the necessary duties required in connection with these Acts, and at the same time, protect the constitutional rights of employers against wrongful charges.

Arc Welding Manual and Operator's Training Course. 218 pages, 5 1/2 by 8 inches. Published by the Hobart Bros. Co., Troy, Ohio. Price, 50 cents.

This little book is especially timely in view of the growing demand for training in arc-welding. It contains part of the material used in a more complete treatise on the subject entitled "Arc Welding and How to Use It," previously published by this concern. The condensed booklet gives concise instructions covering the procedure to follow in arc welding, and is intended to be of help especially to those who cannot attend a welding school. The exercises are based on the welding course offered by the Hobart Bros. Co.

Technical Drafting. By Charles H. Schumann. 793 pages, 6 by 9 1/4 inches. Published by Harper & Bros., 49 E. 33rd St., New York City. Price, $3.50.

This volume is an exceptionally comprehensive textbook on engineering drafting. It is divided into two parts, the first covering a complete elementary course in mechanical drafting, and the second part presenting more advanced work, suitable for use by engineers and architects. The latter section deals with commercial practice in the various branches of engineering, including welded construction, architectural drawings, and topographical drafting.

(Continued on page 182)

Ex-Cell-O Boring
precision m
dat

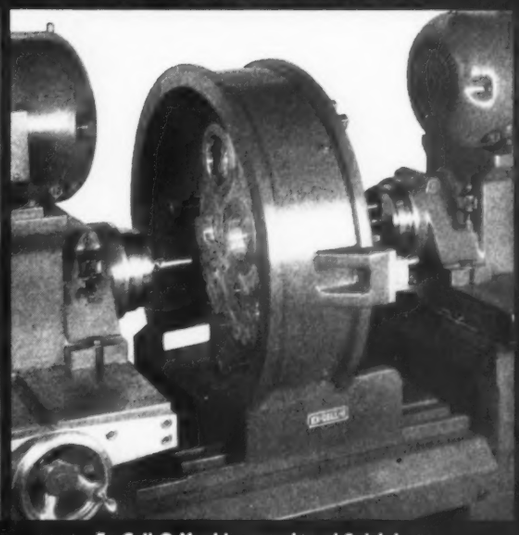
Precision . . . COMES INTO ITS OWN!

IN a practical way, an Ex-Cell-O Precision Machine represents a basic requirement of modern industry—*extreme accuracy in measurement.* Without exceedingly fine measurements—as available with every Ex-Cell-O machine—and the interchangeability of parts that such precision allows, today's mass production of manufactured products would be impossible . . . the vital high production speed on which the success of our nation's defense program now depends could not possibly be attained. Ex-Cell-O is a pioneer in constantly developing higher standards of precision performance with machine tools. This is why today—in quantity production of vital parts for airplanes, automobiles, tractors, and almost every other major product requiring metal parts held to closest possible limits—Ex-Cell-O Precision Machines and Tools are being widely used in all the important industries. If your problem is one that involves the making of precision metal parts on a high-speed, economical basis, you will find it well worth-while to consult Ex-Cell-O.

EX-CELL-O CORPORATION · 1212 OAKMAN BLVD. · DETROIT, MICH.

irplane studs being ground from the solid on battery of Ex-Cell-O Style 33 Precision Automatic Thread Grinders.

Turning and chamfering aluminum piston for liquid cooled aircraft engine on an Ex-Cell-O Precision Boring Machine.



Style 1212 Precision Boring Machine finish boring holes in aluminum piston assembly for hydromatic propellers.

Ex-Cell-O Machine rough and finish boring, chamfering and facing magnesium alloy rear case for aircraft engine.

A 12 pitch thread being ground from the solid on rotating propeller cam on 31 Ex-Cell-O Precision Thread Grinder.

EX-CELL-O (XLO) *Precision* **MACHINES AND TOOLS**

EX-CELL-O CORPORATION
1212 Oakman Blvd., Detroit, Michigan

Please send bulletins on Thread Grinding and Precision Boring.

*Name*_____ *Title*_____

*Company*_____

*Address*_____

SECOND PROGRESS REPORT OF THE JOINT INVESTIGATION OF CONTINUOUS WELDED RAIL, Conducted by the Engineering Experiment Station of the University of Illinois in Cooperation with the Association of American Railroads. By Herbert F. Moore, Howard R. Thomas, and Ralph E. Cramer. 20 pages, 6 by 9 inches. Published by the University of Illinois, Urbana, Ill., as Reprint Series No. 17 of the Engineering Experiment Station.

WHAT THE BUSINESS MAN SHOULD KNOW OF THE LABOR LAW AND ITS ADMINISTRATION. By J. Raymond Tiffany and Benjamin Werne. 63 pages, 5 1/2 by 8 1/4 inches. Distributed by J. Raymond Tiffany, 25 W. 43rd St., New York City. Price, 1 to 50 copies, 50 cents each; 51 to 250, 40 cents each; 251 and over, 25 cents each.

MACHINE DESIGN. By Louis J. Bradford and Paul B. Eaton. 275 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, $3.

This is the fourth edition of a treatise on machine design intended for use in courses where time is limited, the text being designed to be covered in about twenty-five lessons. The advances in the practice of gear design, the improved methods of spring design, and the rise of V-belts as a means of power transmission have necessitated the present edition, which incorporates the new methods and also amplifies the portion of the book dealing with the selection of ball and roller bearings.

TIME AND MOTION STUDY. By Stewart M. Lowry, Harold B. Maynard, and G. J. Stegemerten. 432 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York City. Price, $5.

This is the third edition of a handbook on the principles and methods of making time and motion studies and constructing formulas for wage incentives. The object is to present all the information necessary to develop a practical working system that can be applied in any industry quickly and simply, without interfering with production or upsetting the workers.

Two veteran General Electric machinists, Charles Koch (left) and Edward Koch, Sr. (right), cast experienced eyes on the lathe technique of the youngest member of their family, Edward Koch, Jr. All three—grandfather, son, and grandson—are employed in the General Electric Co.'s Schenectady Works. Charles Koch, who operates a boring mill in the generator and motor department, has been associated with the company for forty-eight years; his son, Edward, Sr., who is also a boring mill operator in the turbine department, has had twenty-two years of experience with the company; while Edward, Jr., has just finished the first year of his four-year apprenticeship

STATEMENT OF THE OWNERSHIP, MANAGEMENT, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933,

of MACHINERY, published monthly at New York, N. Y., for October 1, 1940.

State of New York } ss.
County of New York }

Before me, a Notary Public, in and for the state and county aforesaid, personally appeared Edgar A. Becker, who having been duly sworn according to law, deposes and says that he is the treasurer of The Industrial Press, Publishers of MACHINERY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The Industrial Press, 140-148 Lafayette St., New York; Editor, Erik Oberg, 140-148 Lafayette St., New York; Managing Editor, None; Business Managers, Robert B. Luchars, 140-148 Lafayette St., New York; Edgar A. Becker, 140-148 Lafayette St., New York; and Erik Oberg, 140-148 Lafayette St., New York.

2. That the owners of 1 per cent or more of the total amount of stock are: The Industrial Press, 140-148 Lafayette St., New York; Robert B. Luchars, 140-148 Lafayette St., New York; Erik Oberg, 140-148 Lafayette St., New York; Edgar A. Becker, 140-148 Lafayette St., New York; Laura A. Brownell, 140-148 Lafayette St., New York; Franklin D. Jones, 140-148 Lafayette St., New York; First National Bank & Trust Co. of Montclair and Robert B. Luchars, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; First National Bank & Trust Co. of Montclair and Leigh Roy Urban, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; First National Bank & Trust Co. of Montclair and Kenneth D. Ketchum, Trustees (Beneficiaries unknown), Upper Montclair, N. J.

3. That the known bondholders, mortgagees and other security holders are: Laura A. Brownell, 140-148 Lafayette St., New York; John Connolly, 140-148 Lafayette St., New York; Franklin D. Jones, 140-148 Lafayette St., New York; Robert B. Luchars, 140-148 Lafayette St., New York; Louis Pelletier, 140-148 Lafayette St., New York; Elizabeth Y. Urban, 163 Western Drive, Longmeadow, Mass.; Helen L. Ketchum, King St., Cohasset, Mass.; Wilbert A. Mitchell, 28 Harlow Road, Springfield, Vt., and Henry V. Oberg, 1317 Hill Crest Road, R. D. No. 1, Lancaster, Pa.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder, or security holder, appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

EDGAR A. BECKER, Treasurer

Sworn to and subscribed before me this 26th day of September, 1940

CHARLES P. ABEL

Notary Public, Kings County No. 292
(SEAL) Kings Register's No. 1111
New York County No. 217, New York Register's No. 1-A-144
(My commission expires March 30, 1941)